

FIG._2

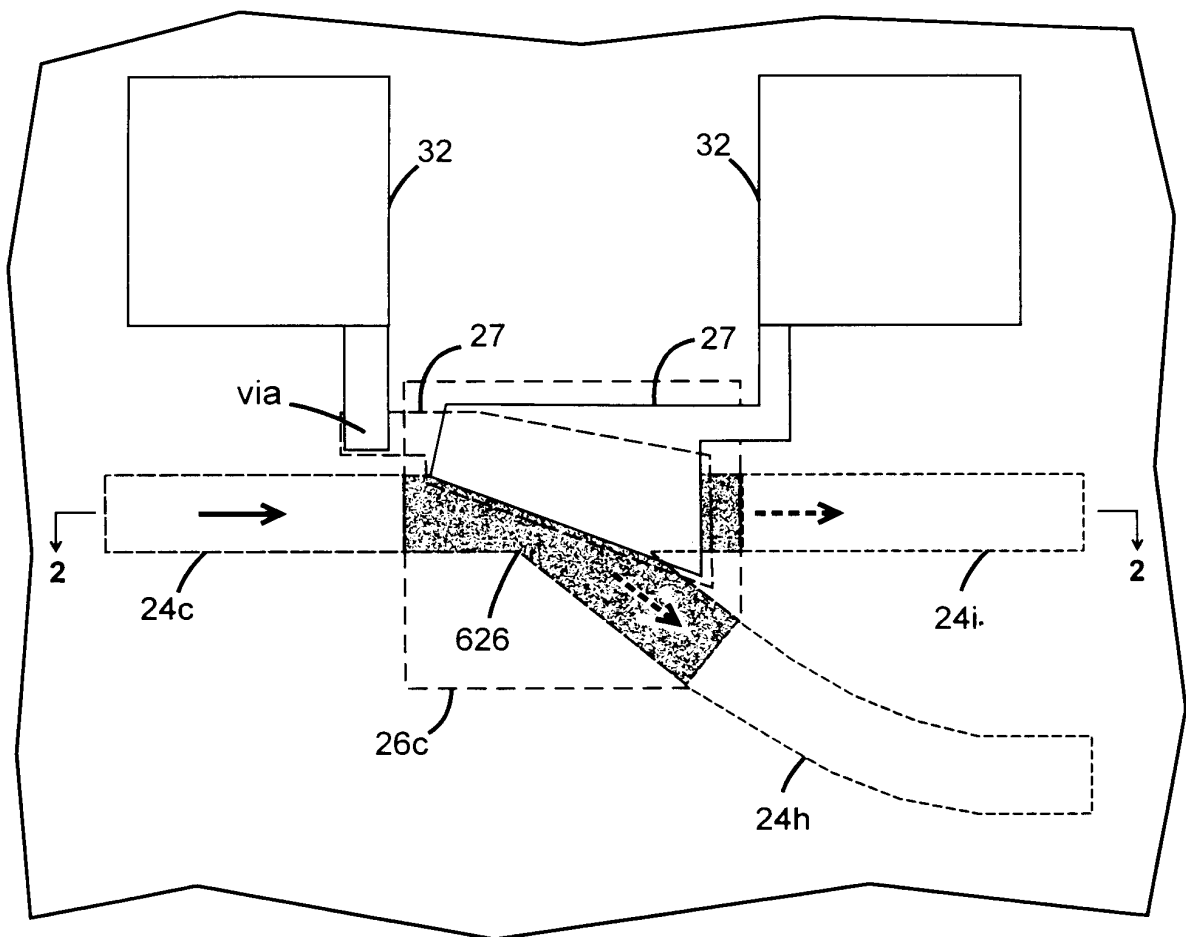


FIG._3

28c'

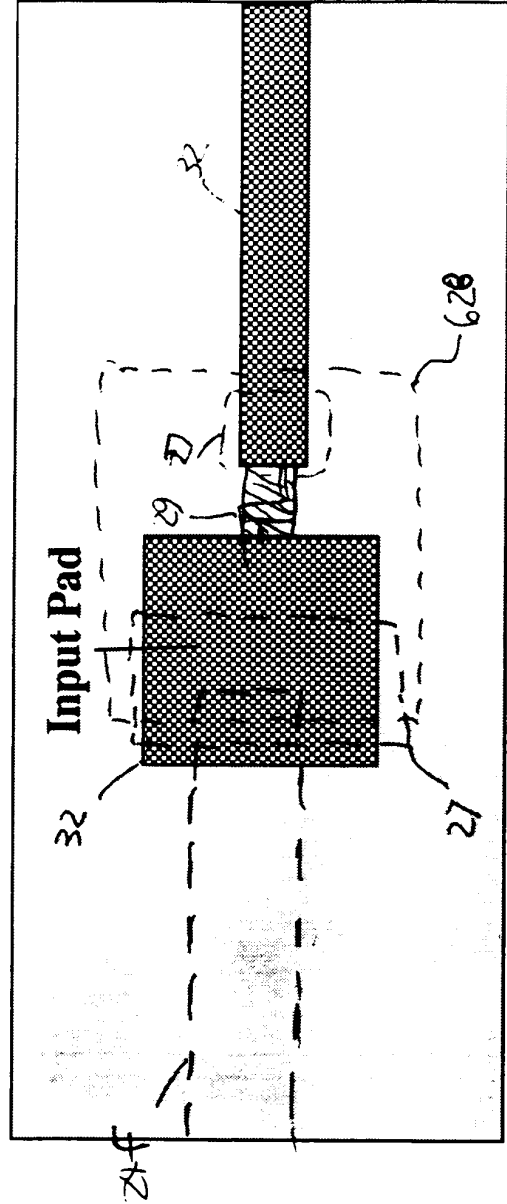


FIG. 5-2

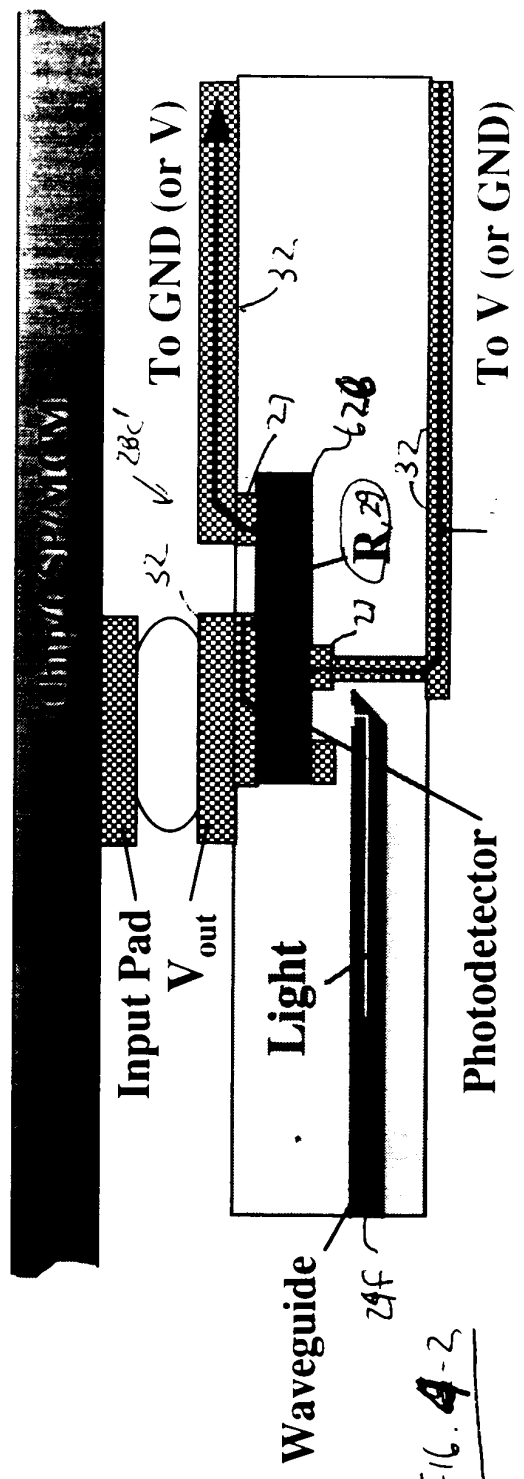


FIG. 4-2

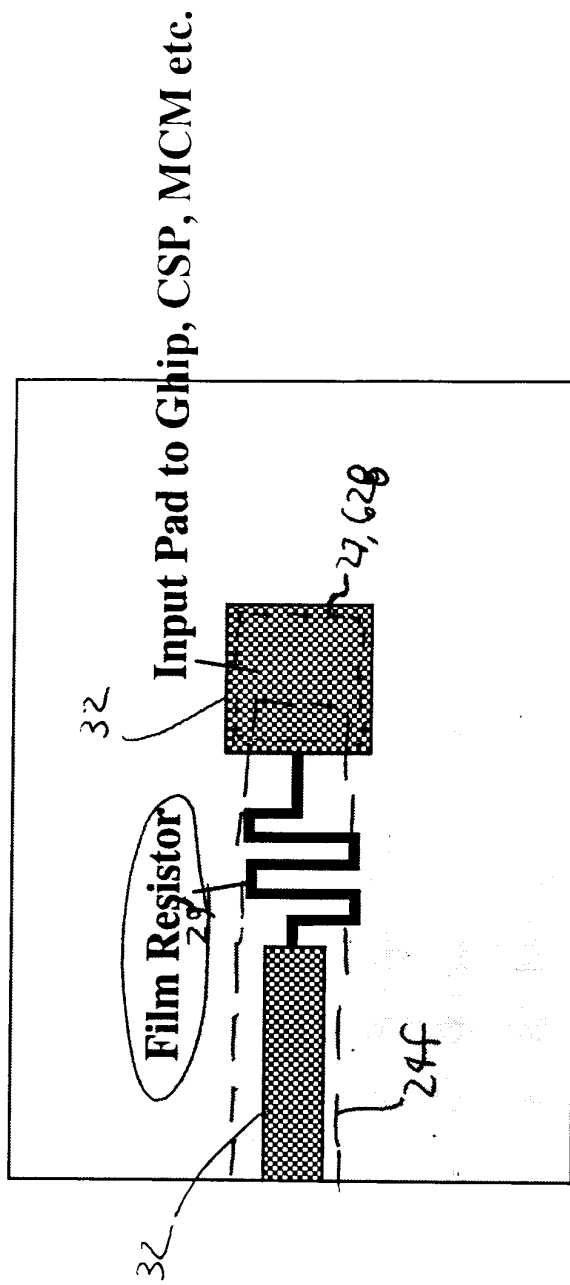


Fig. 5-3

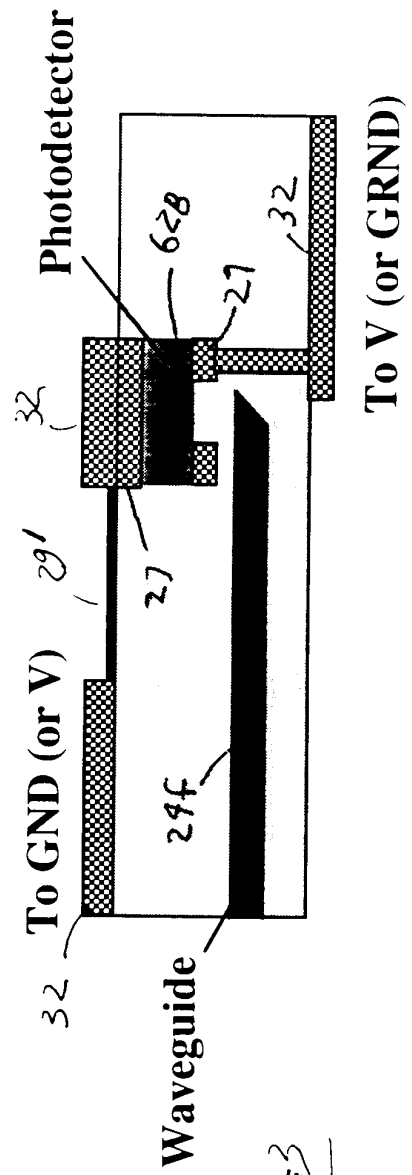


Fig. 4-3

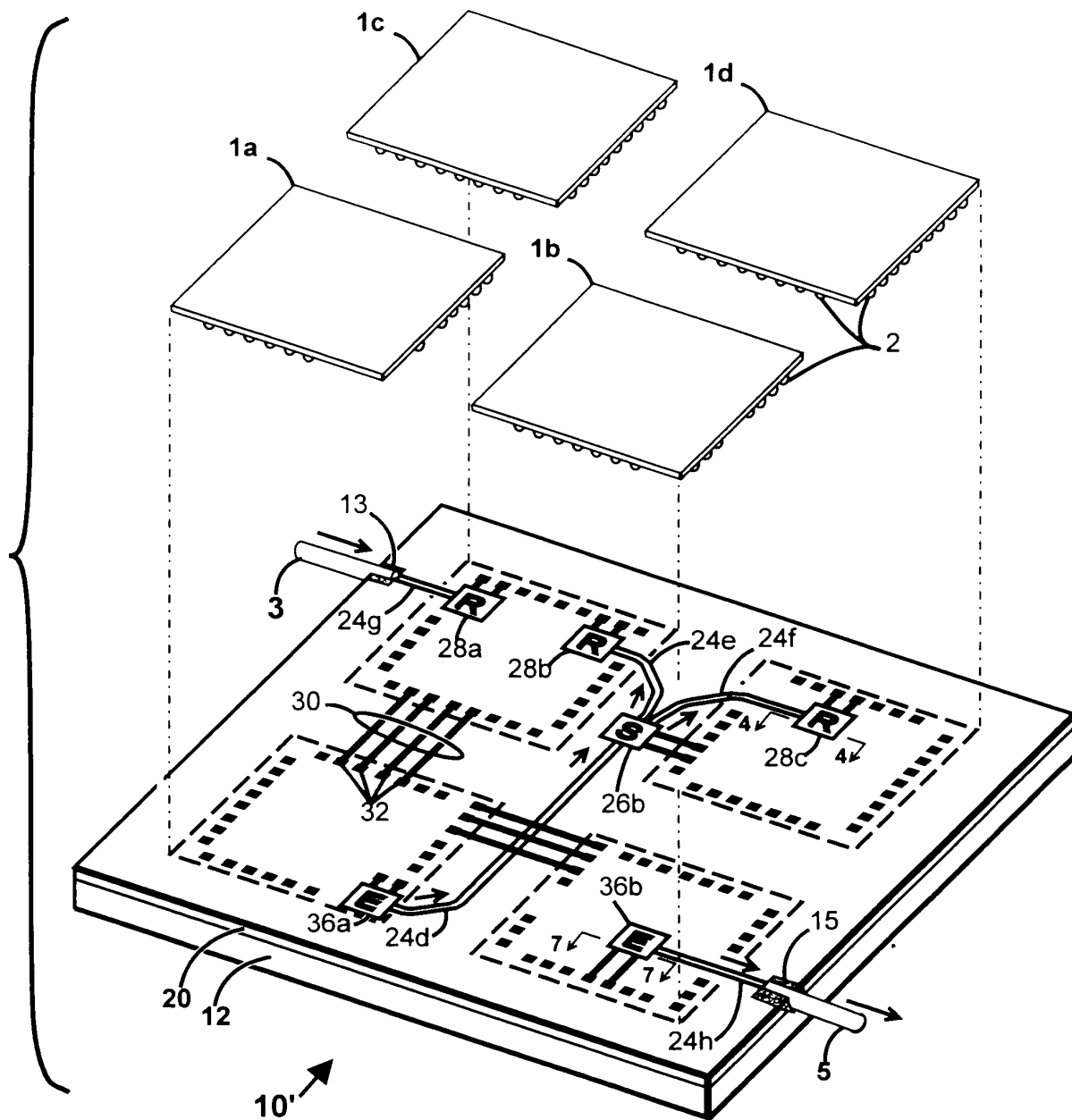


FIG._6

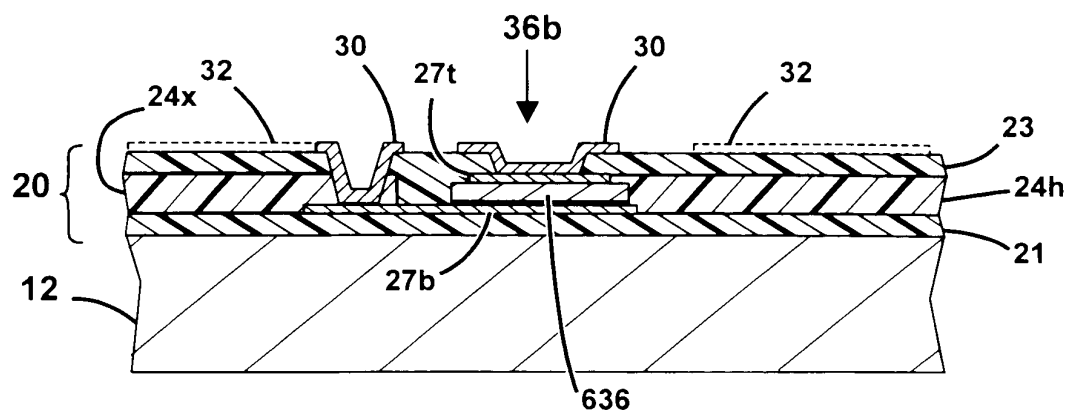


FIG. 7

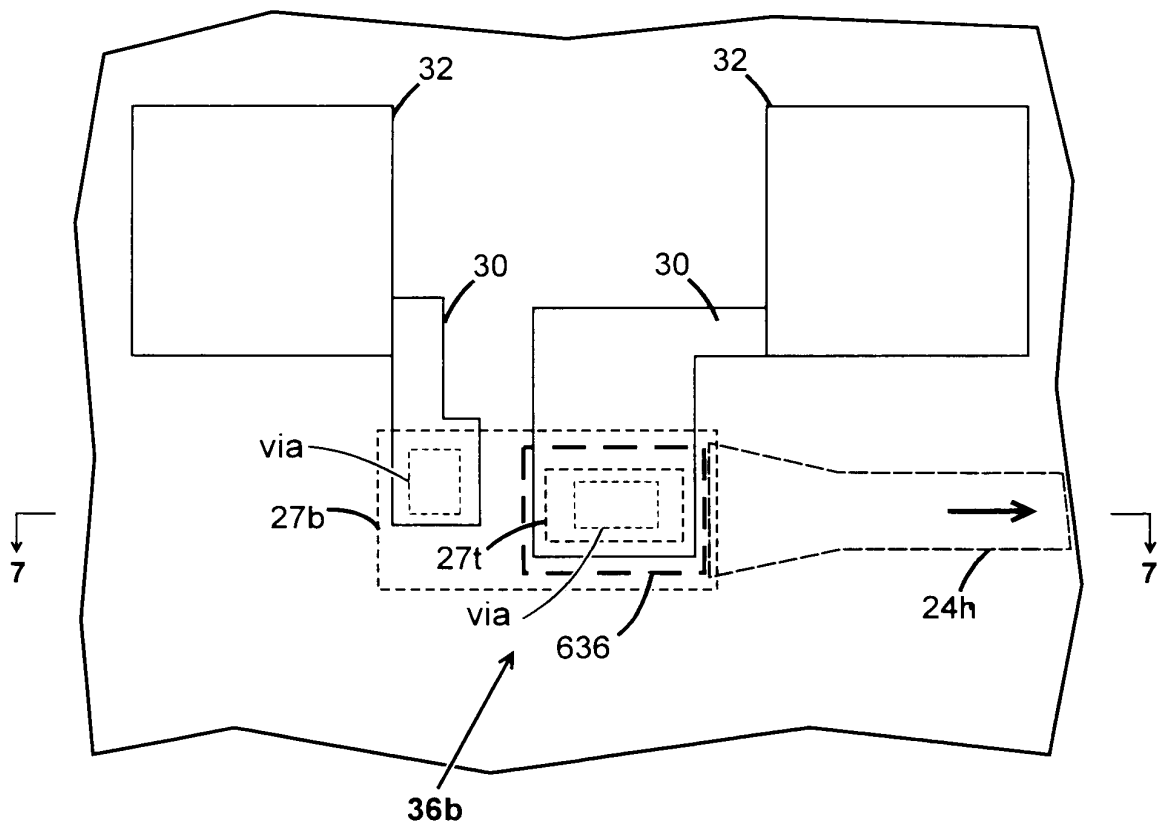


FIG._8

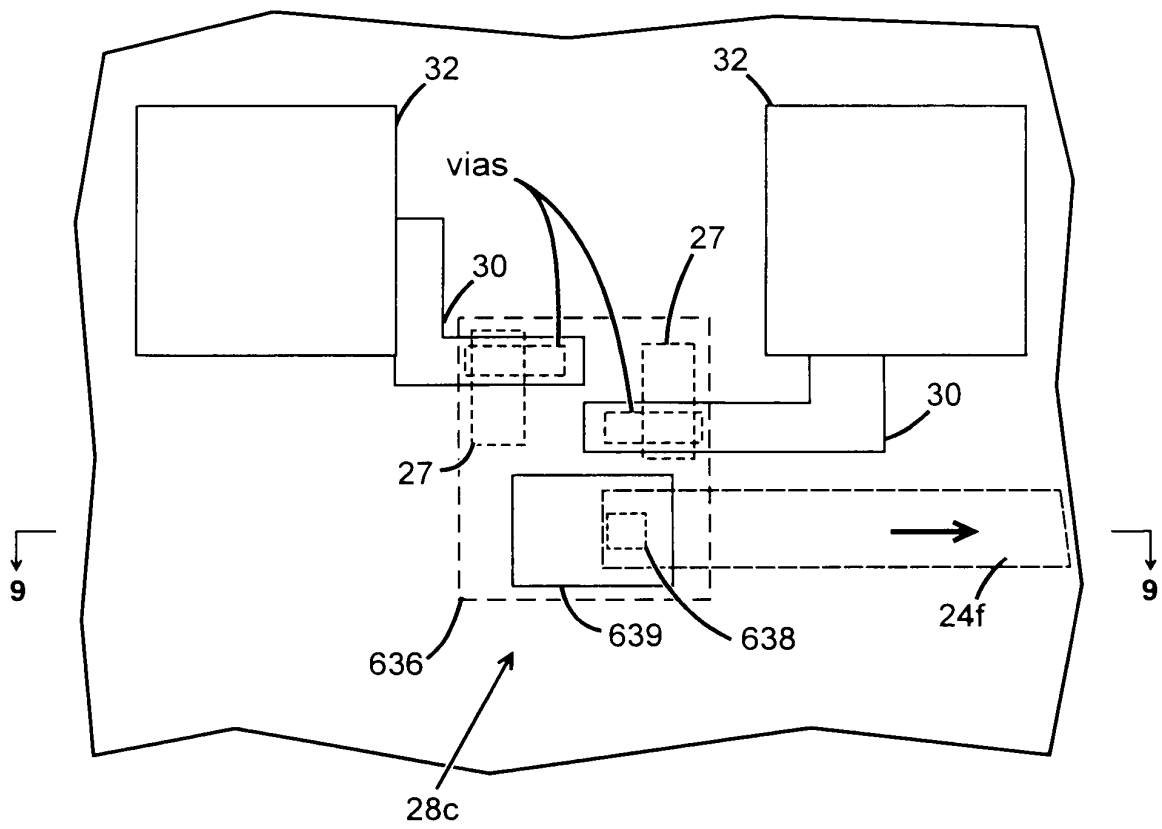
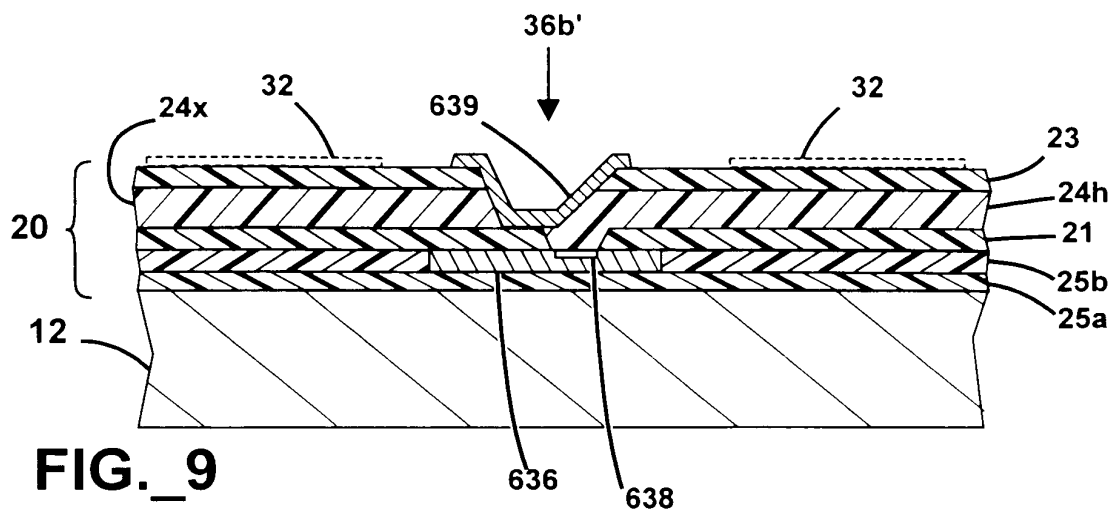


FIG._11

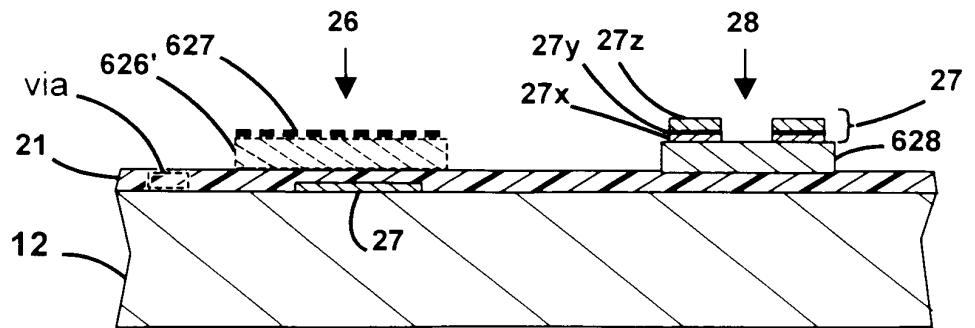


FIG._12

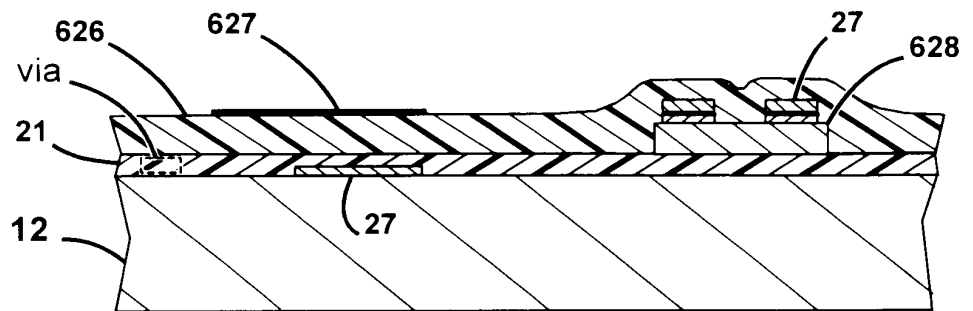


FIG._13

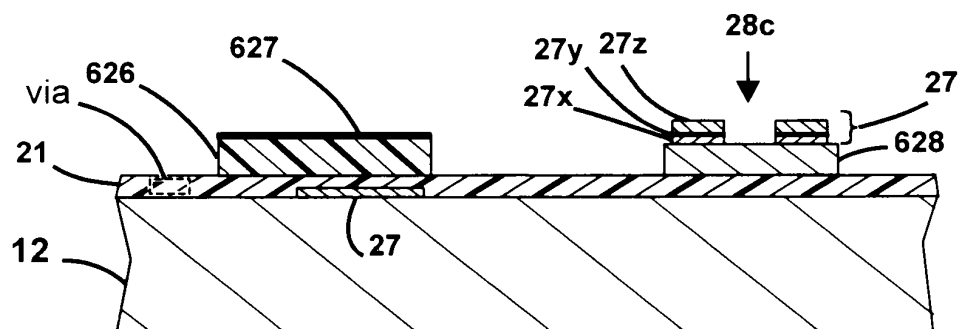


FIG._14

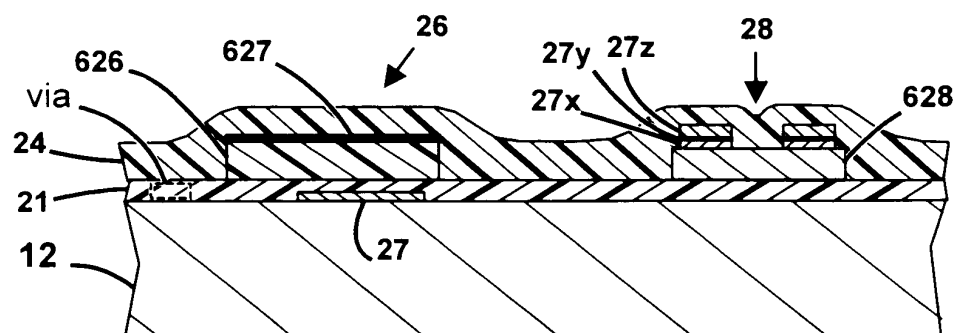


FIG._15

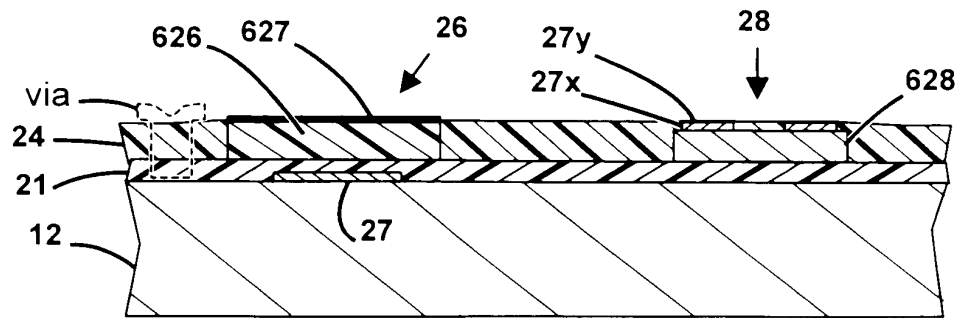


FIG._16

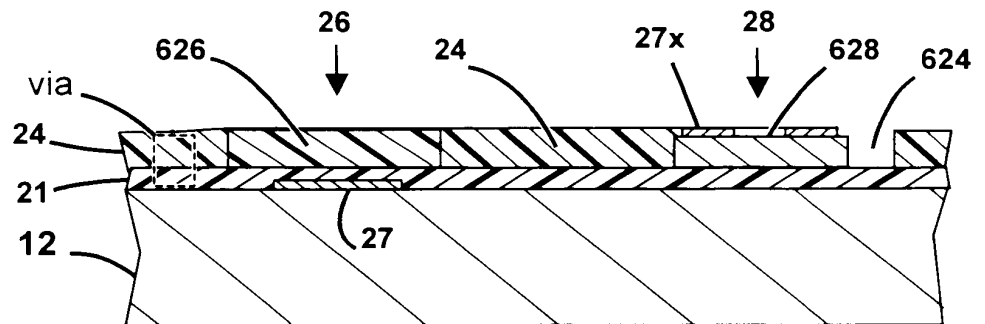


FIG._17

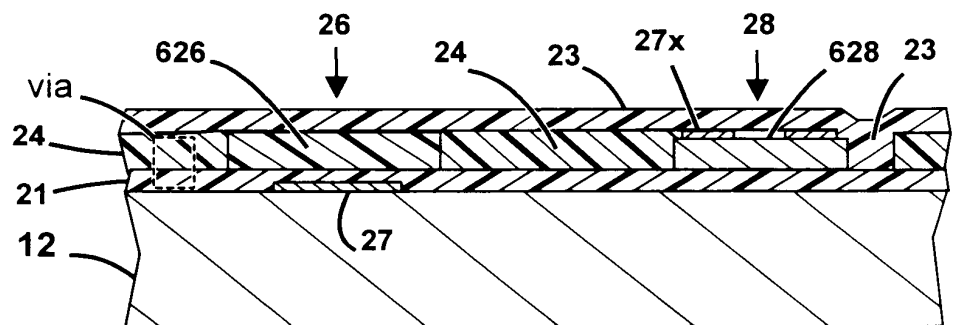
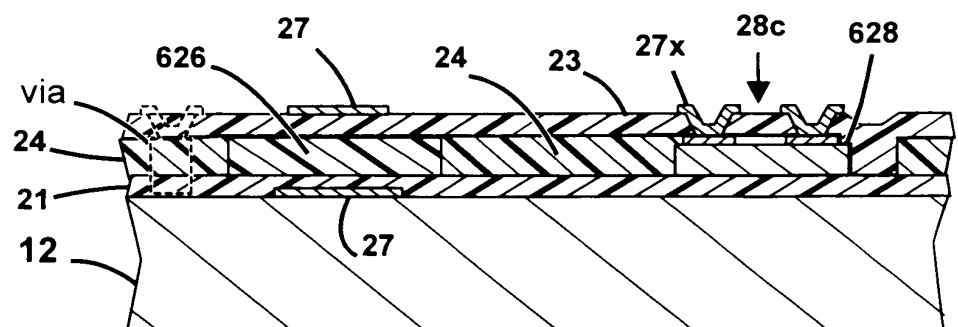


FIG._18



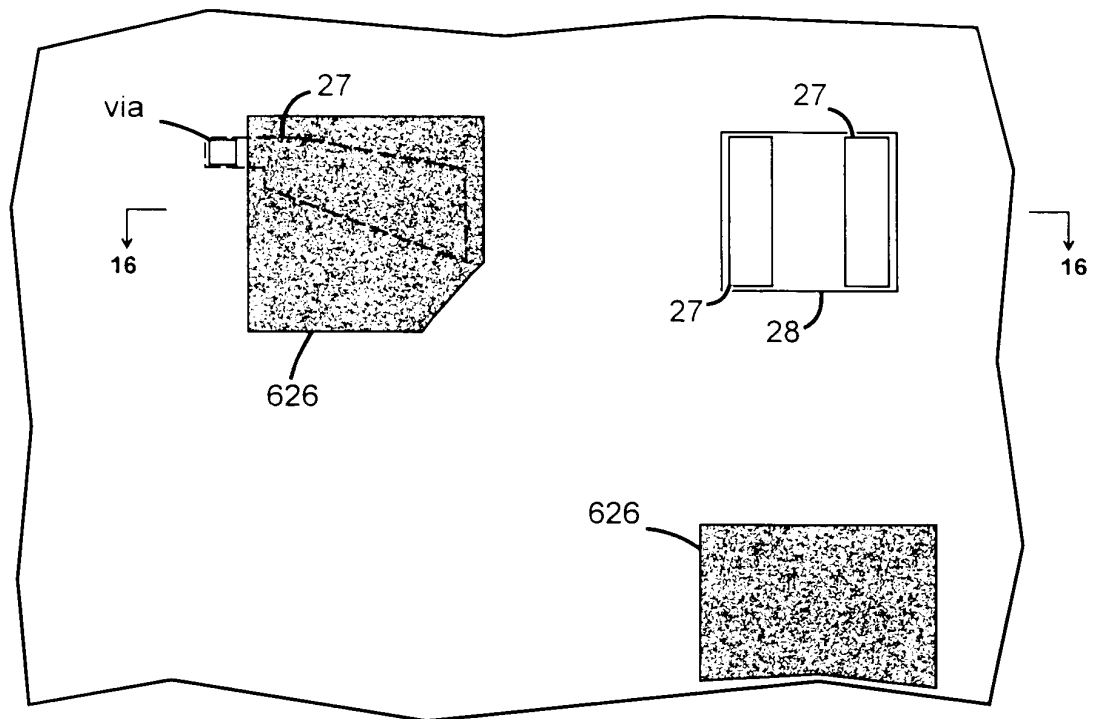


FIG._19

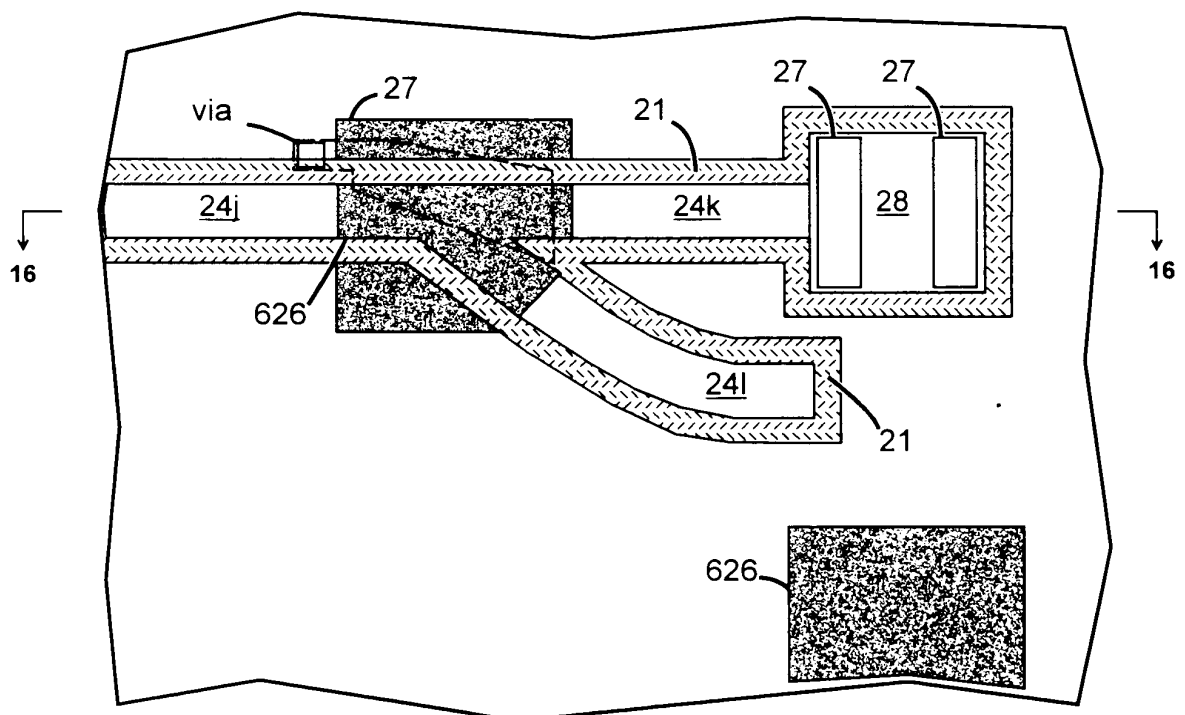


FIG._20

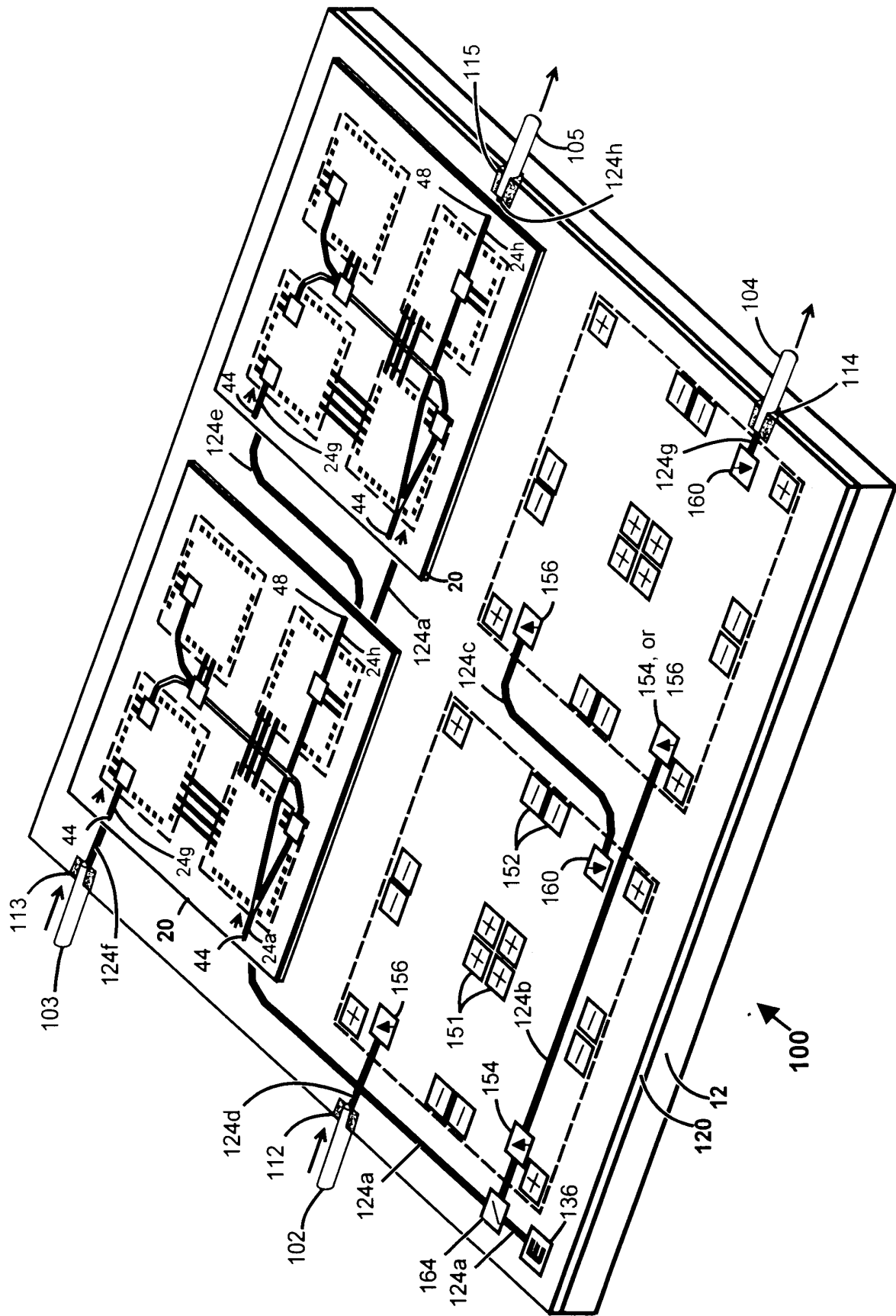


FIG. 21

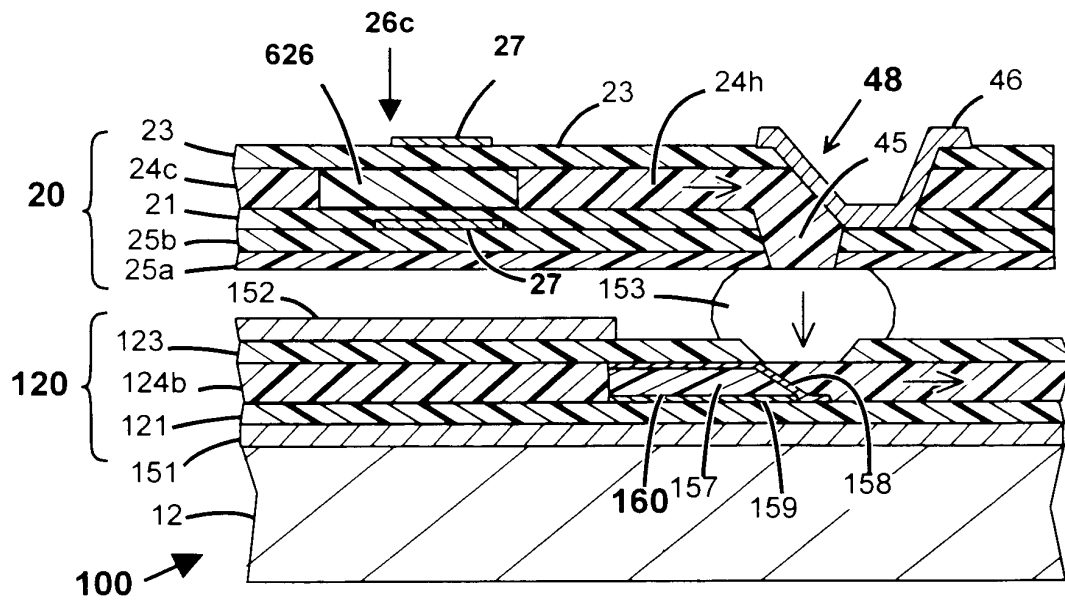


FIG. 24

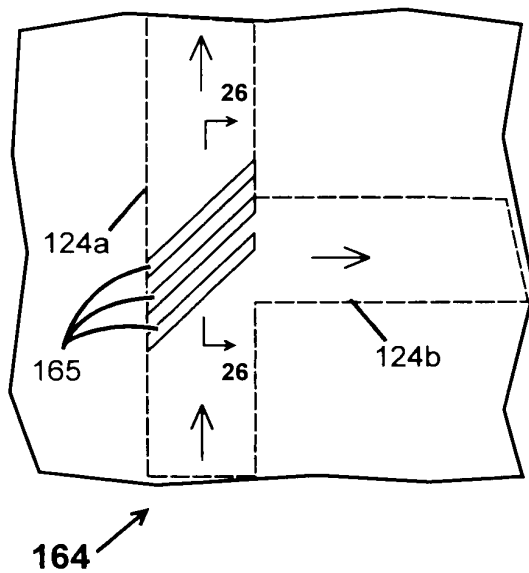


FIG. 25

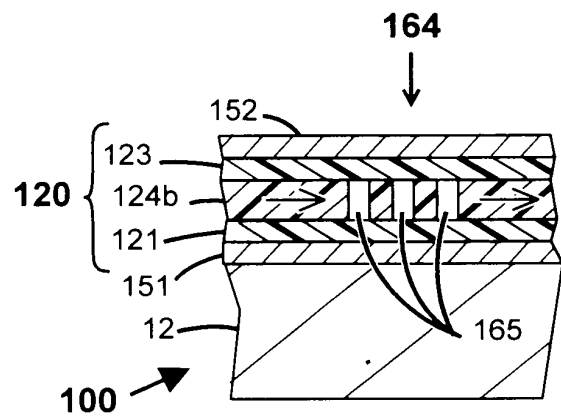


FIG. 26

FIG._27

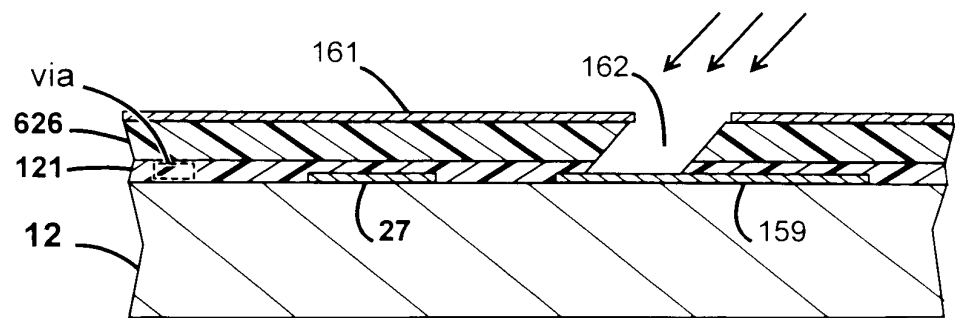


FIG._28

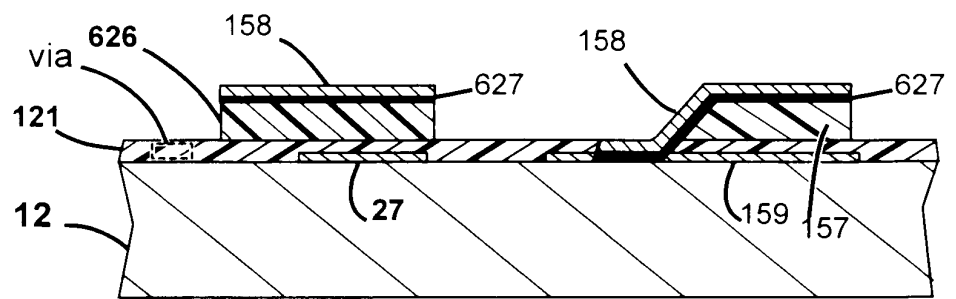


FIG._29

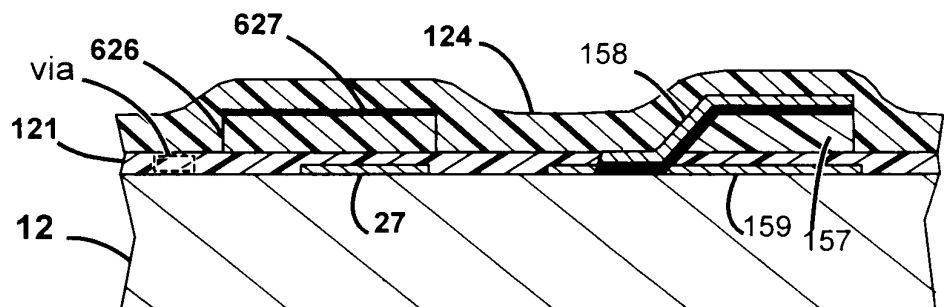
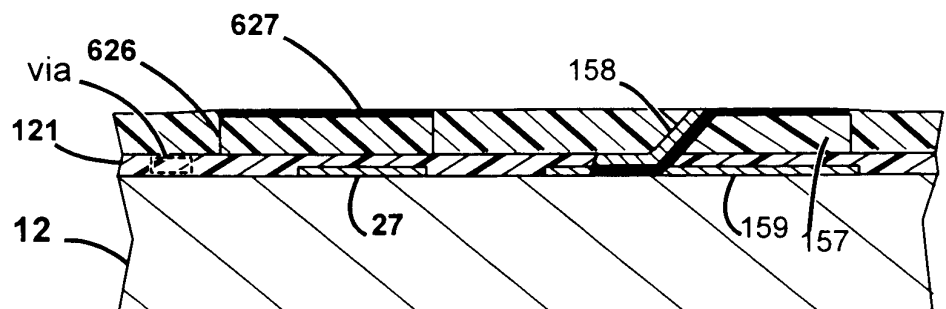


FIG._30



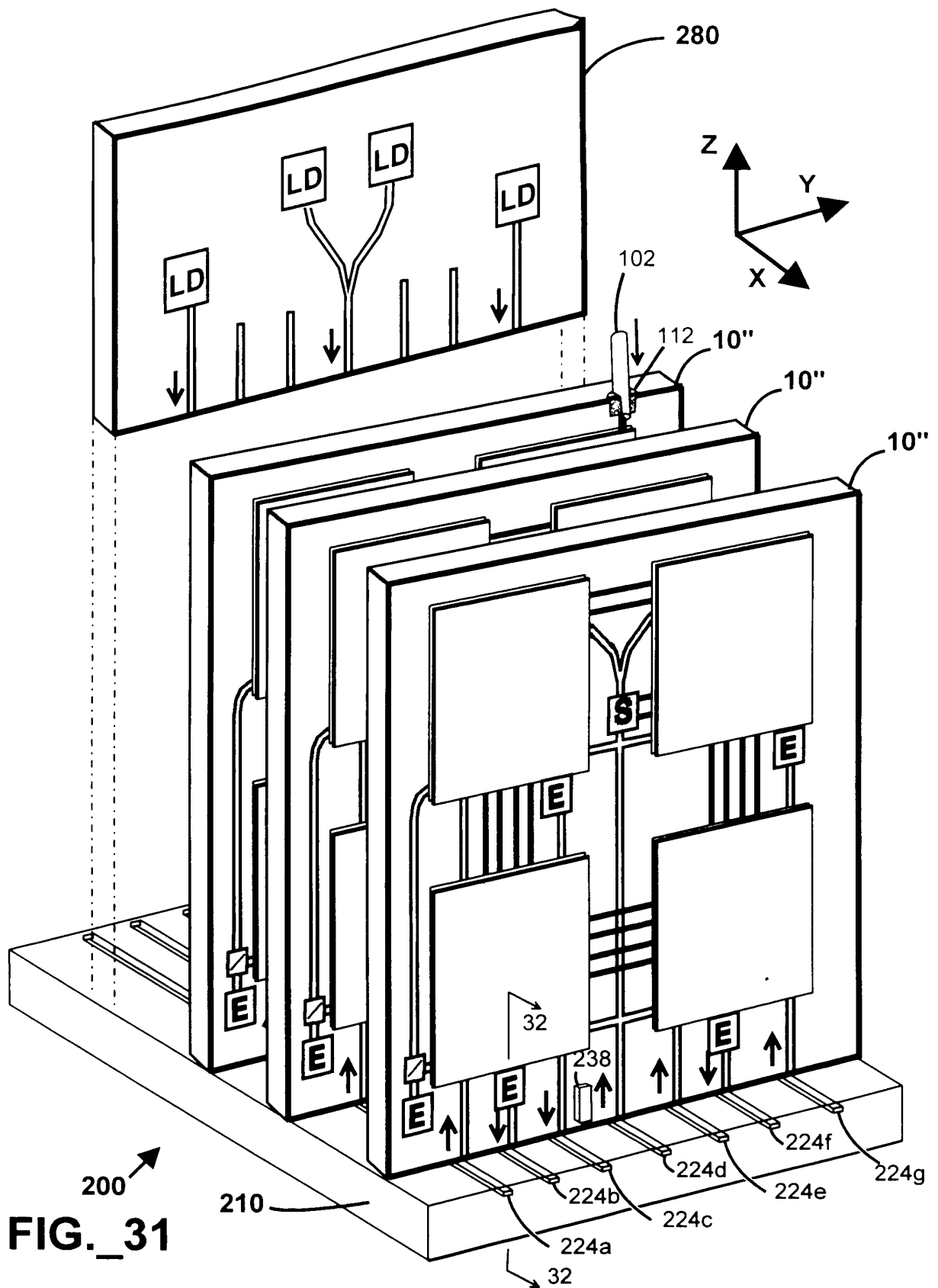


FIG. 32

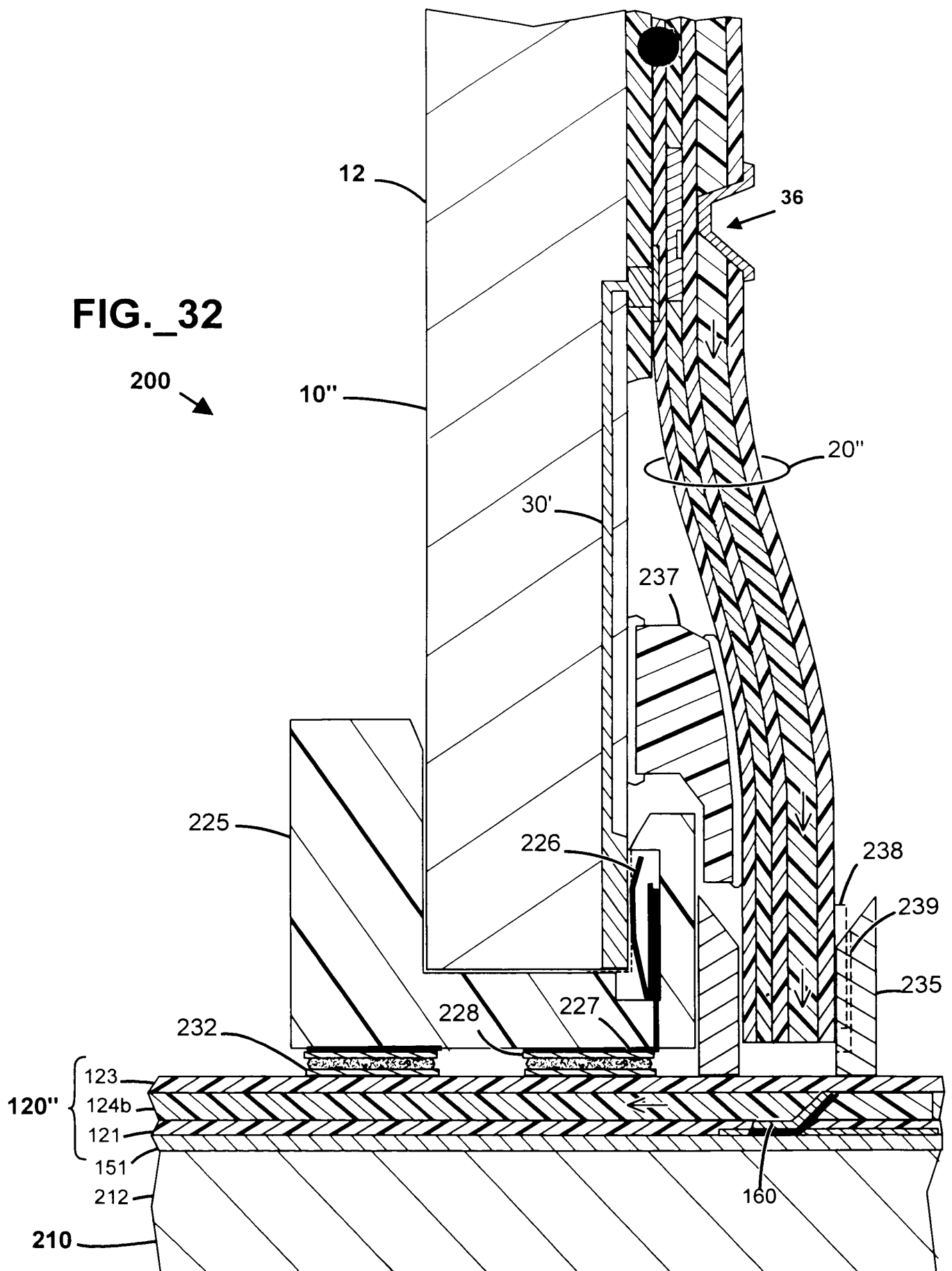
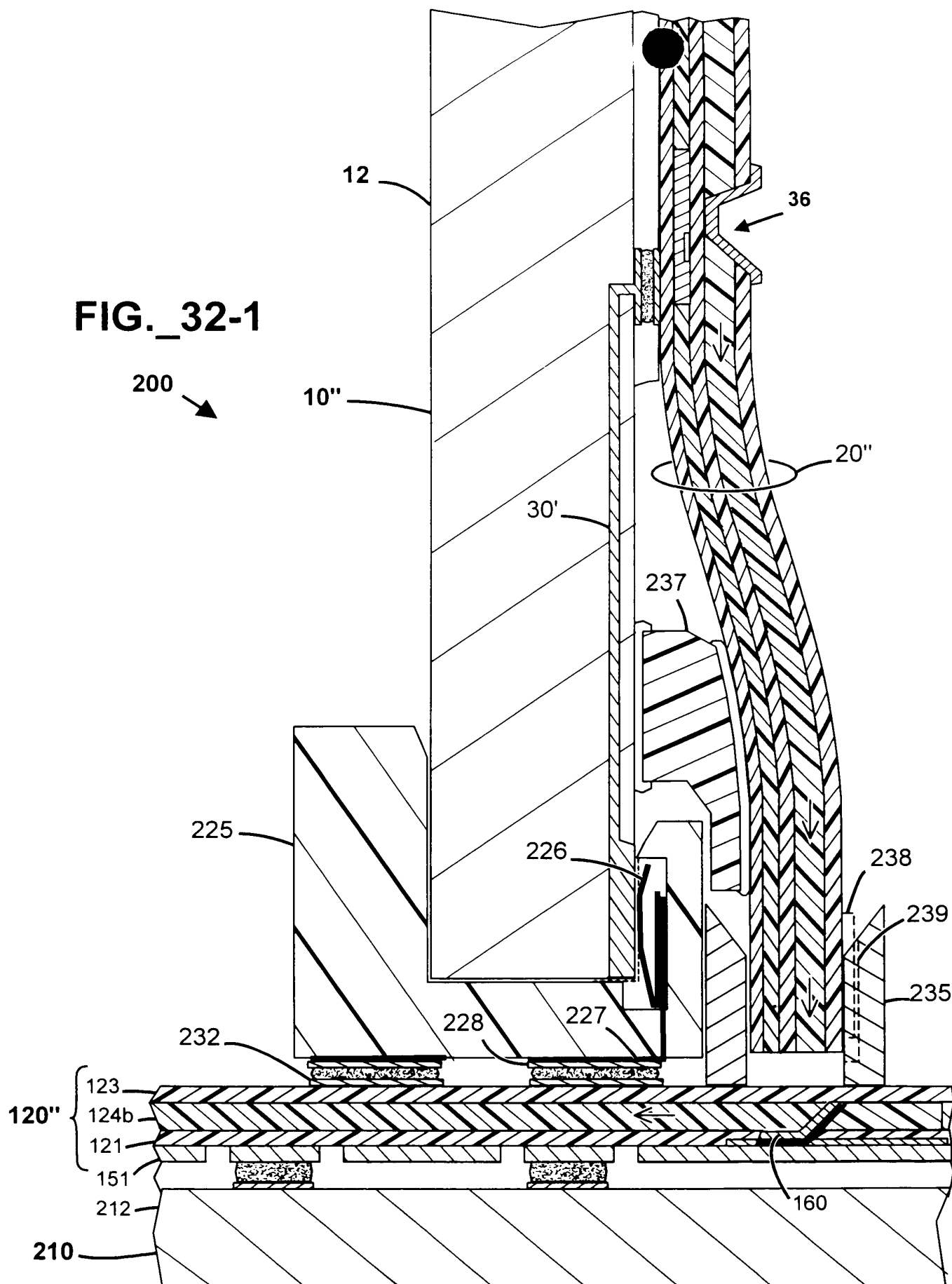


FIG._32-1



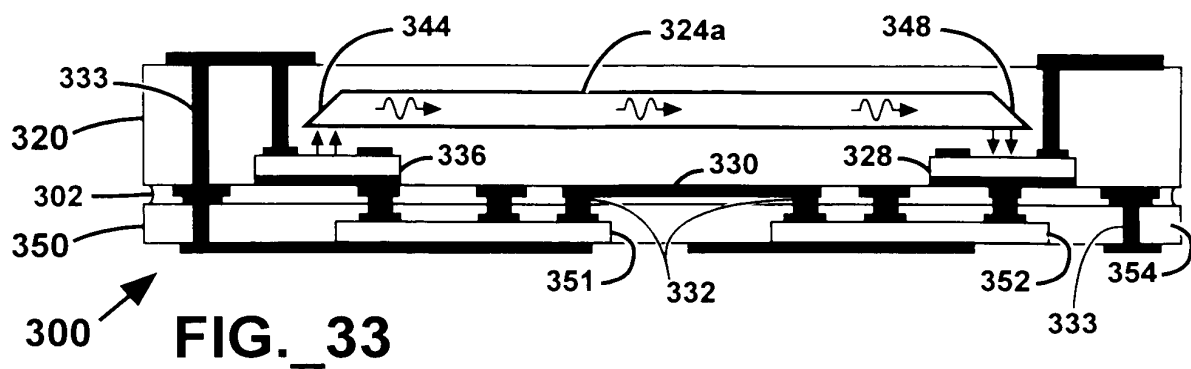
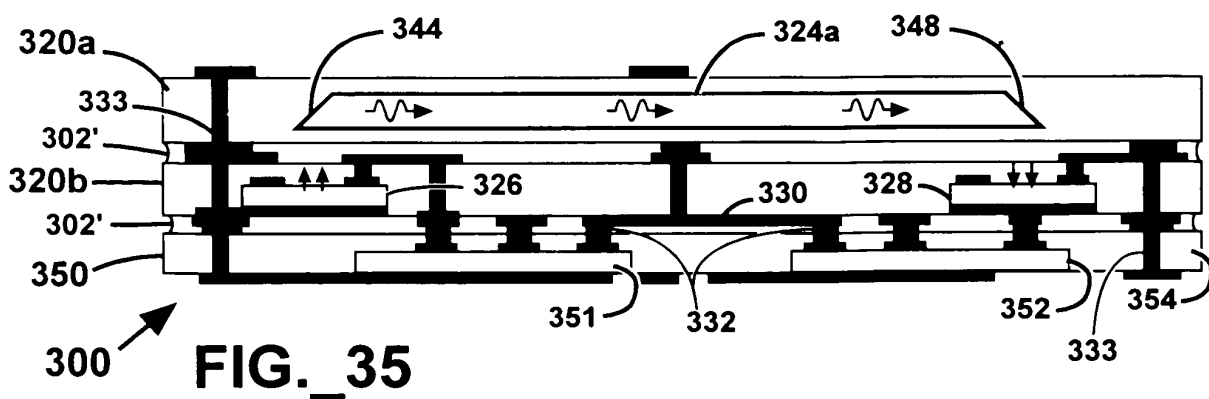


FIG. 34



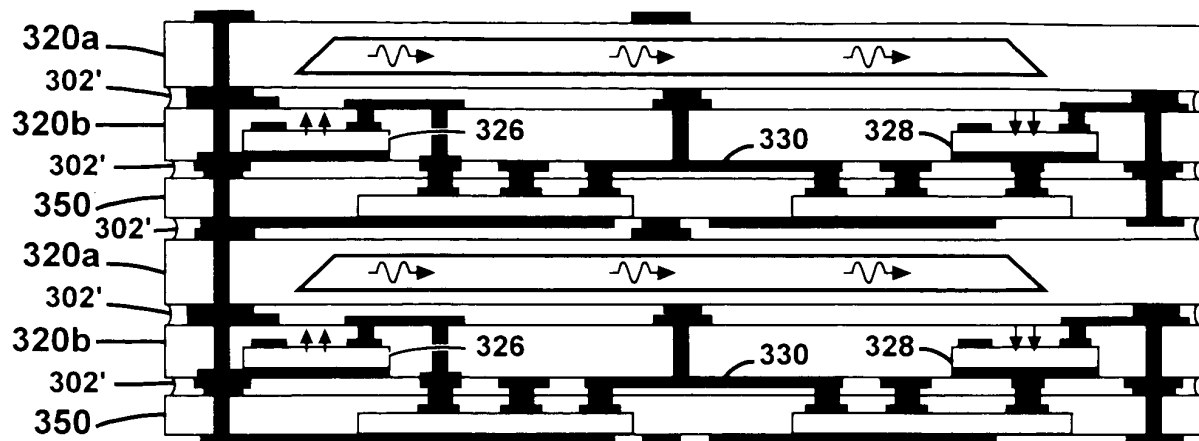


FIG. 36

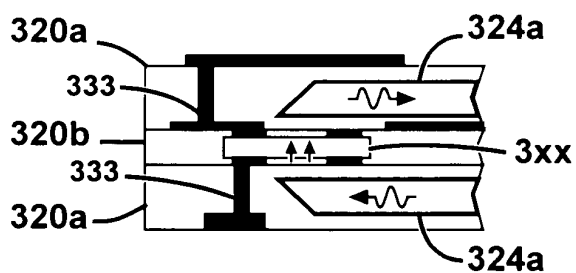


FIG. 37-1

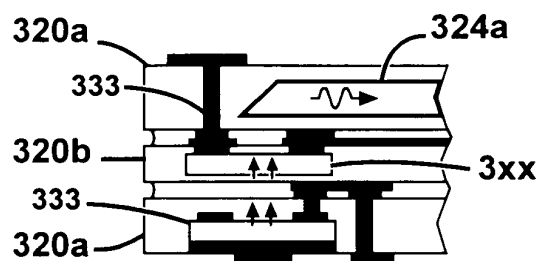


FIG. 37-2

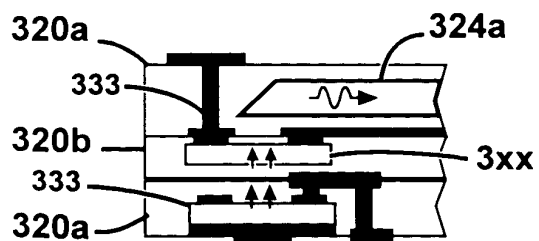


FIG. 37-3

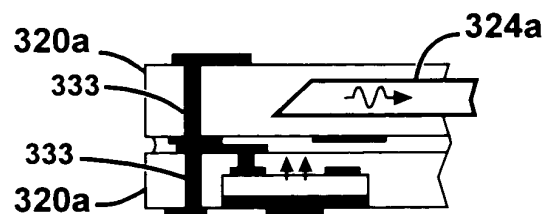


FIG. 37-4

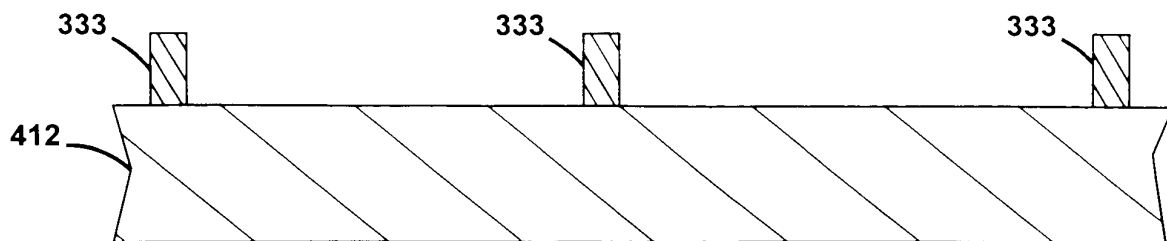


FIG._38

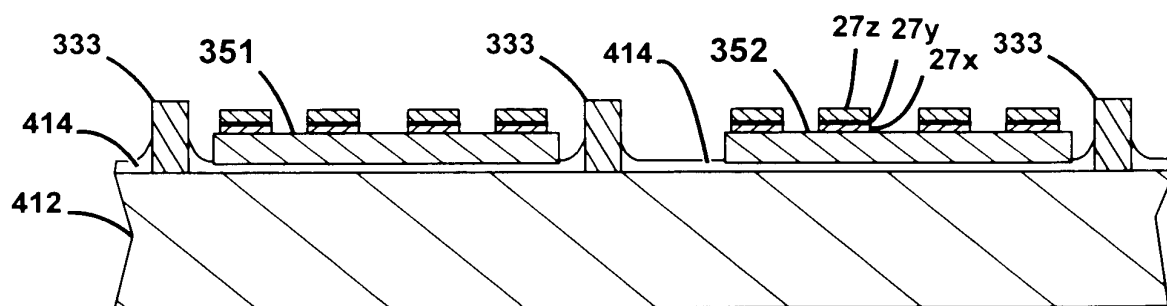


FIG._39

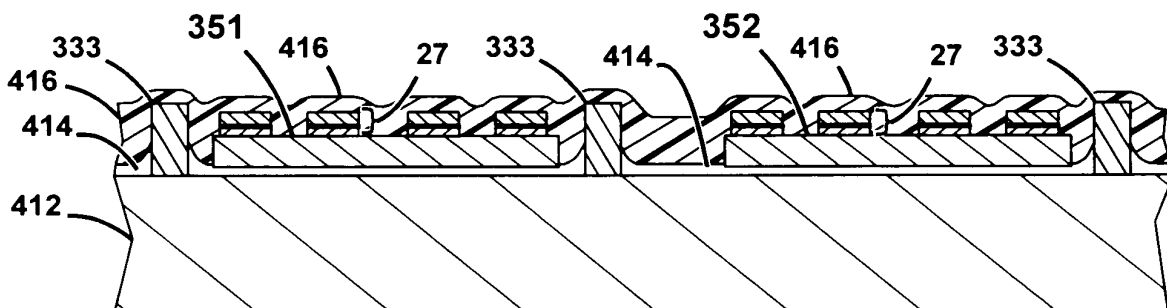


FIG._40

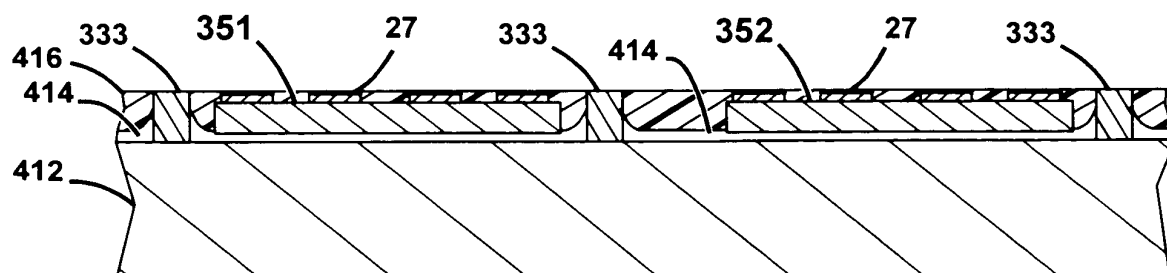


FIG._41

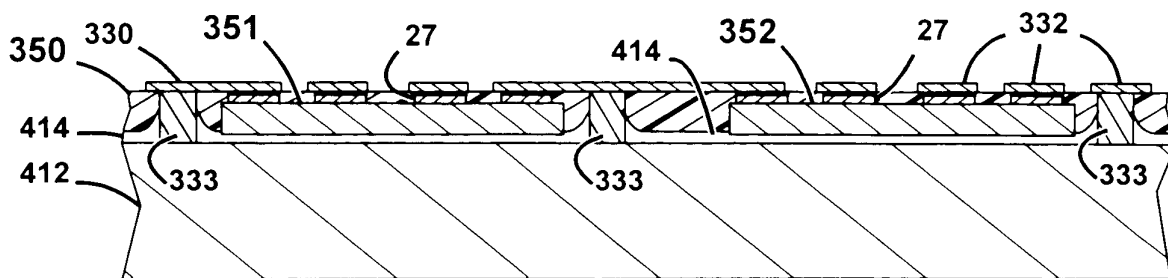


FIG._42

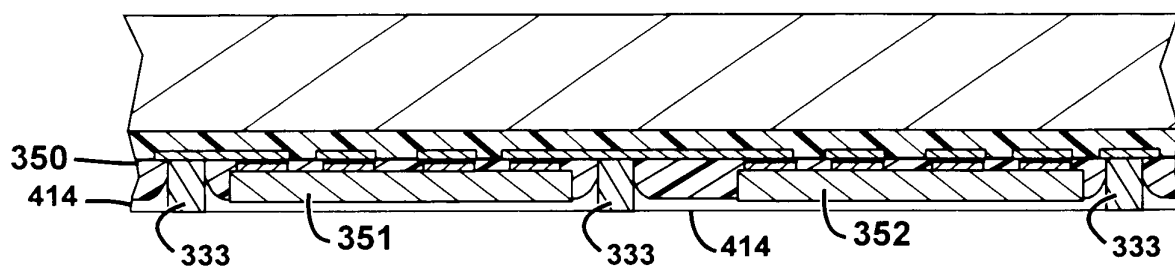


FIG._43

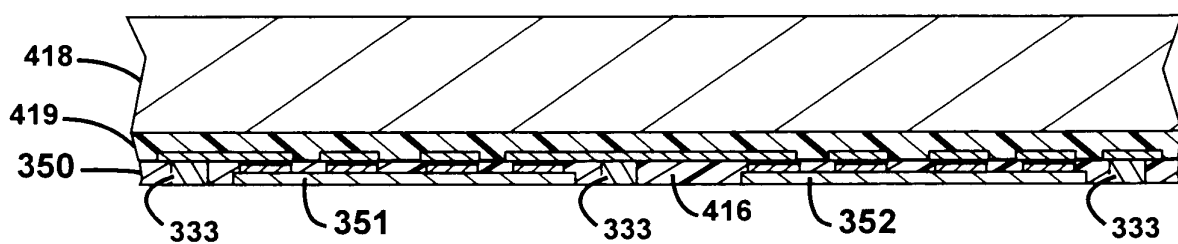


FIG._44

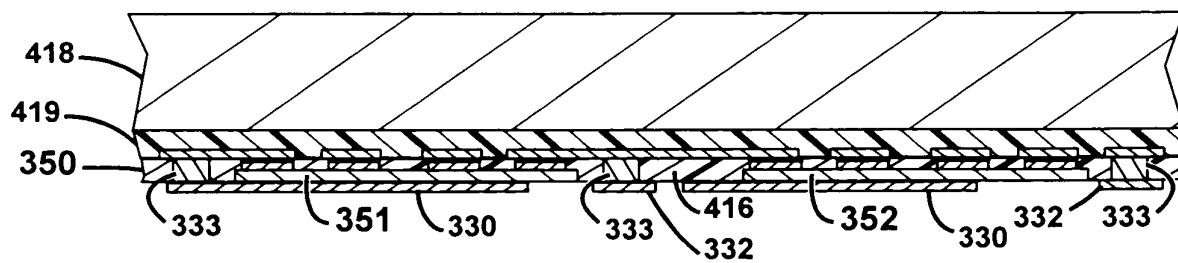
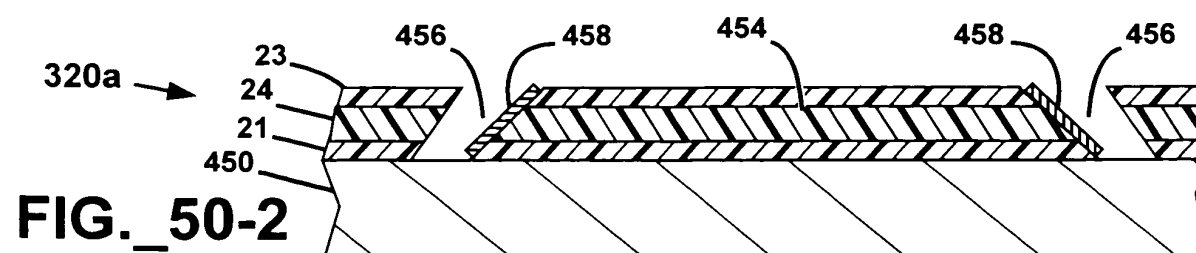
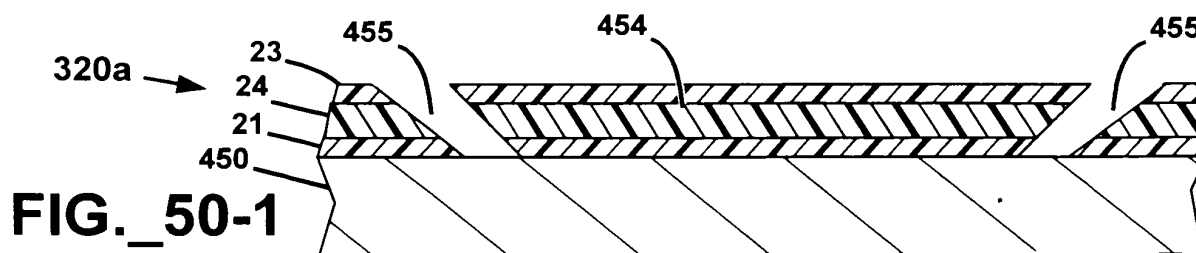
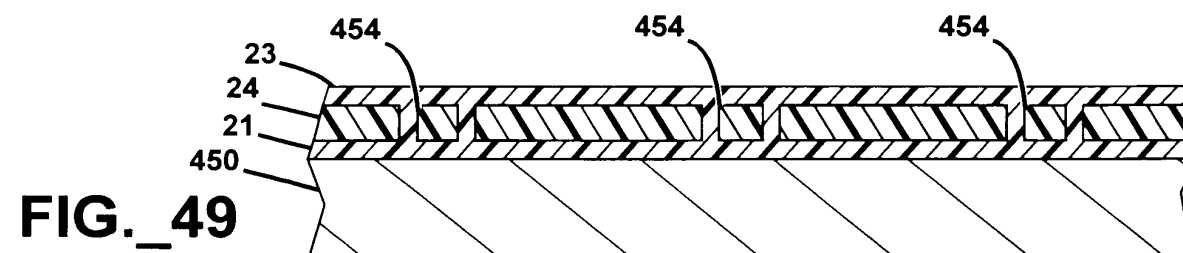
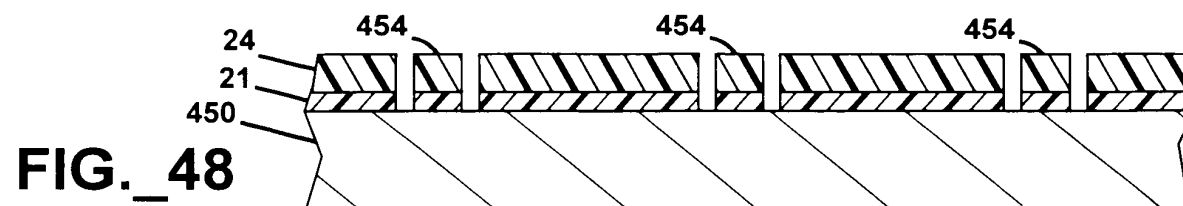
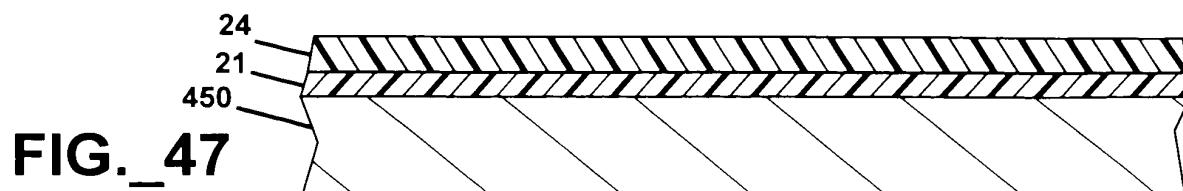
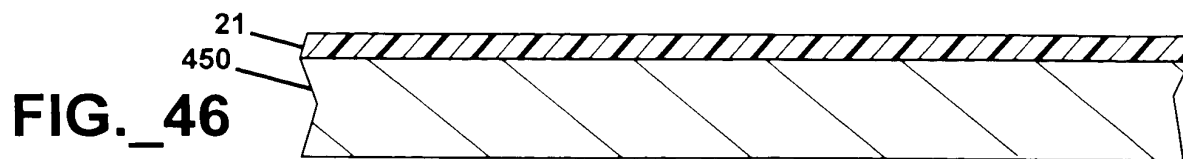
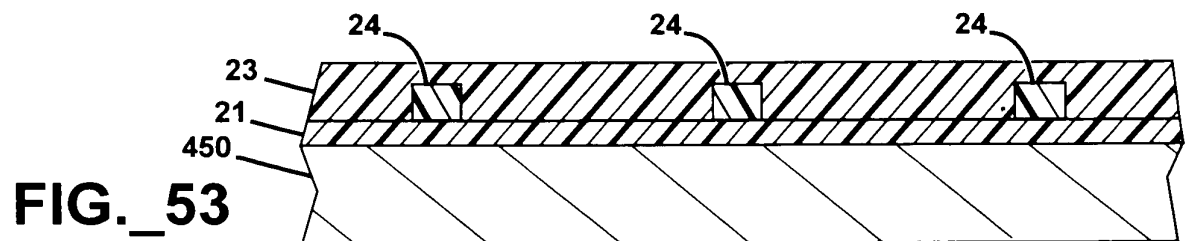
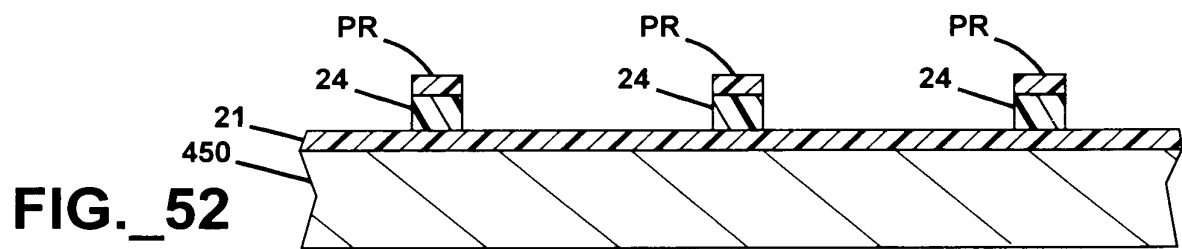
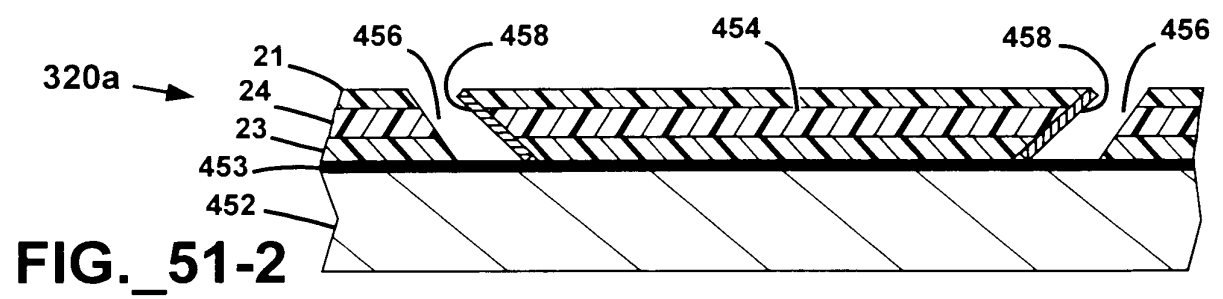
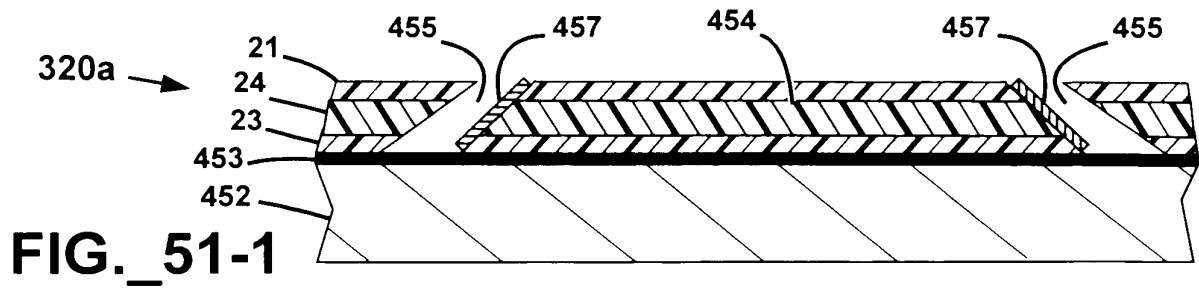
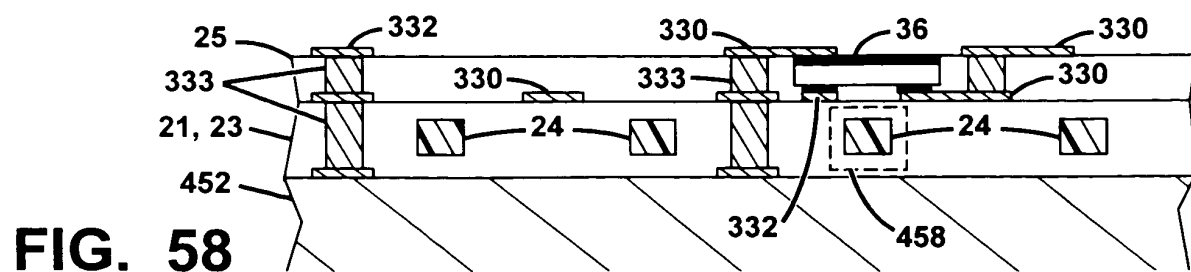
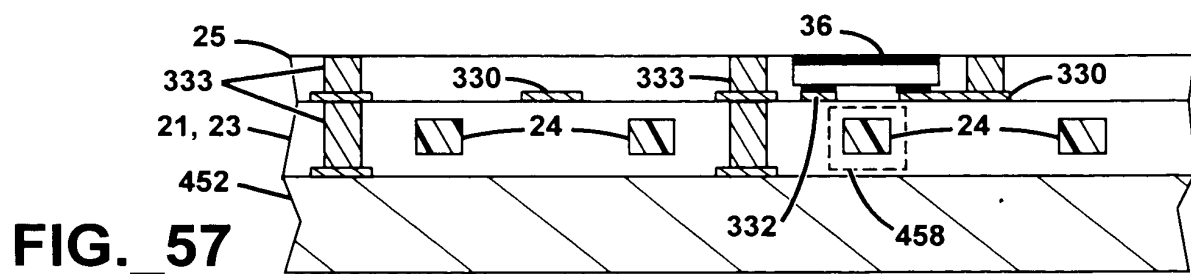
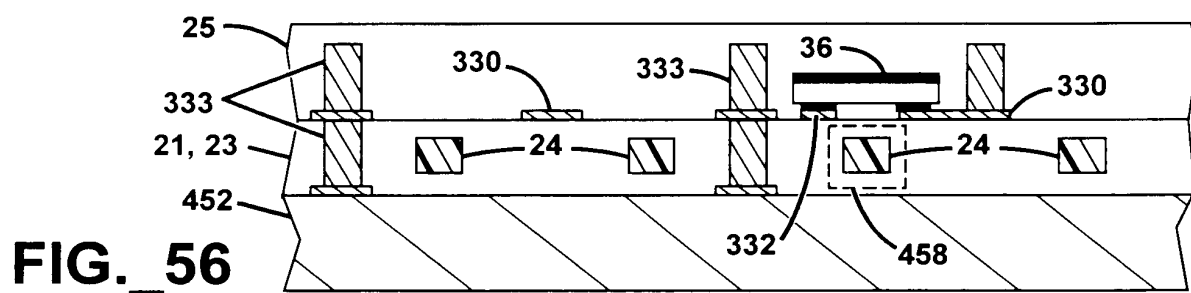
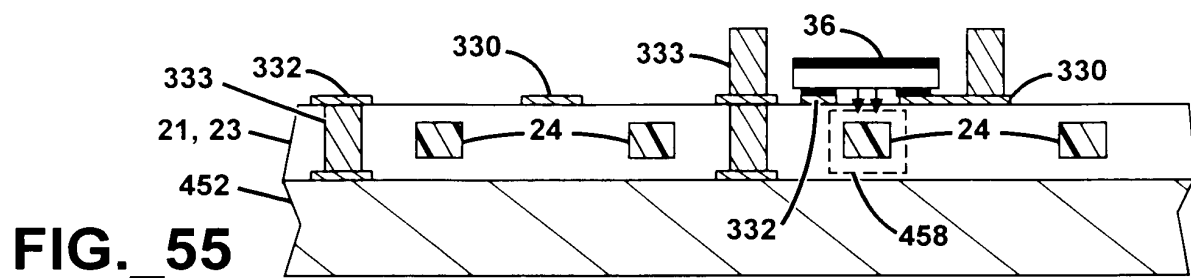
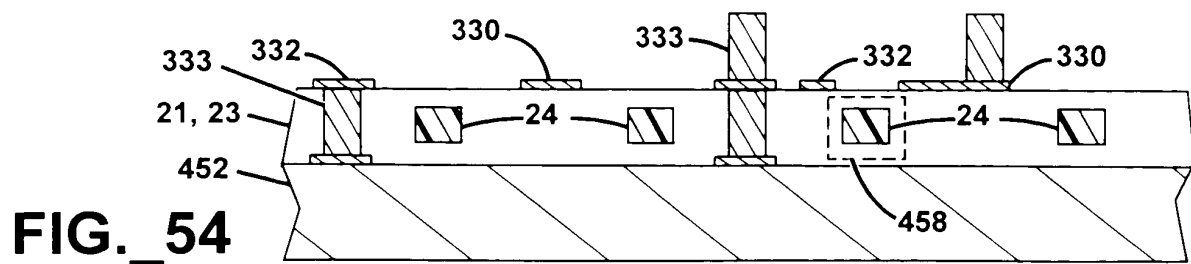


FIG._45







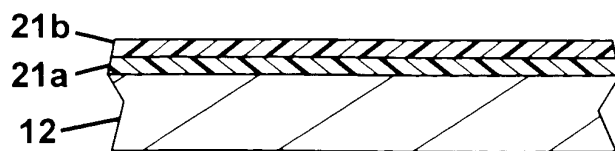


FIG._59

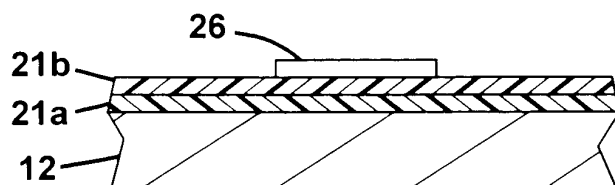


FIG._60

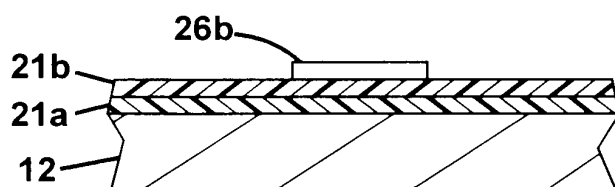


FIG._62

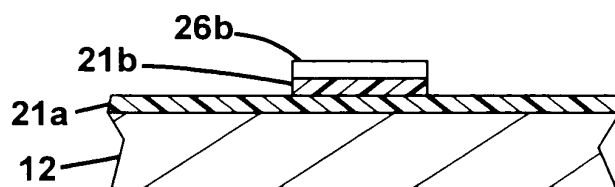


FIG._64

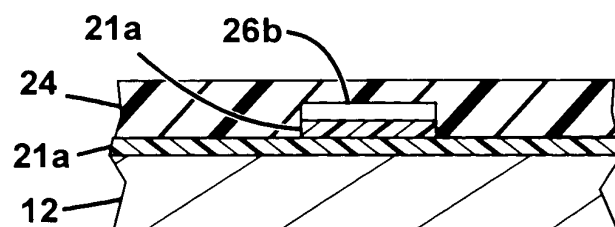


FIG._65

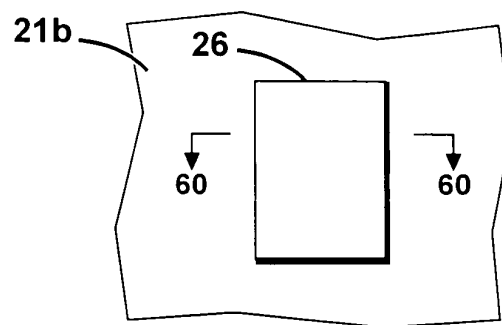


FIG._61

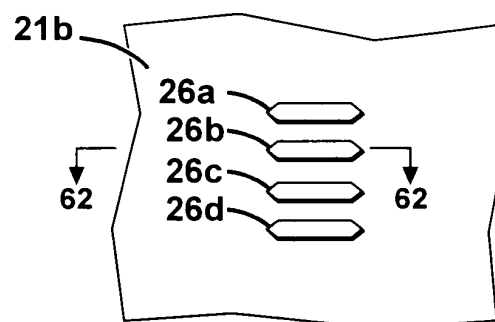


FIG._63

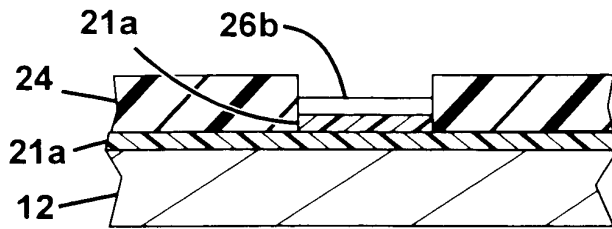


FIG. 66

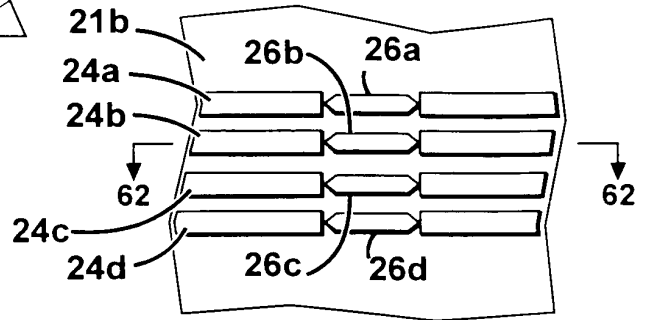


FIG. 67

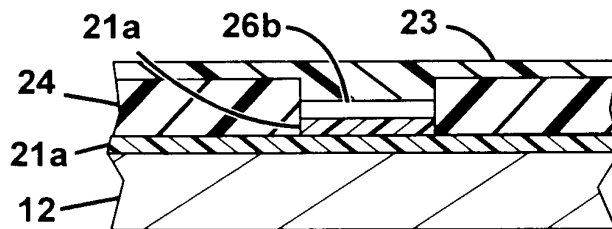


FIG. 68

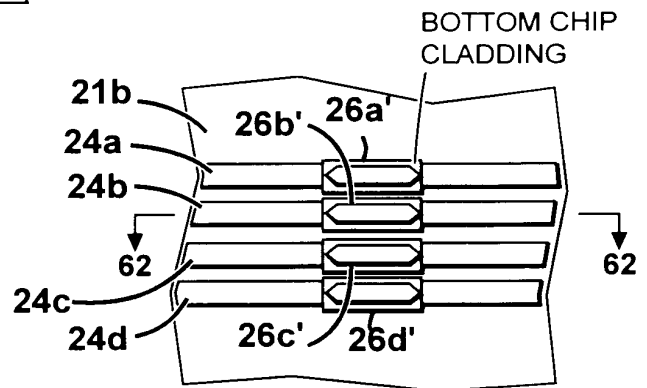
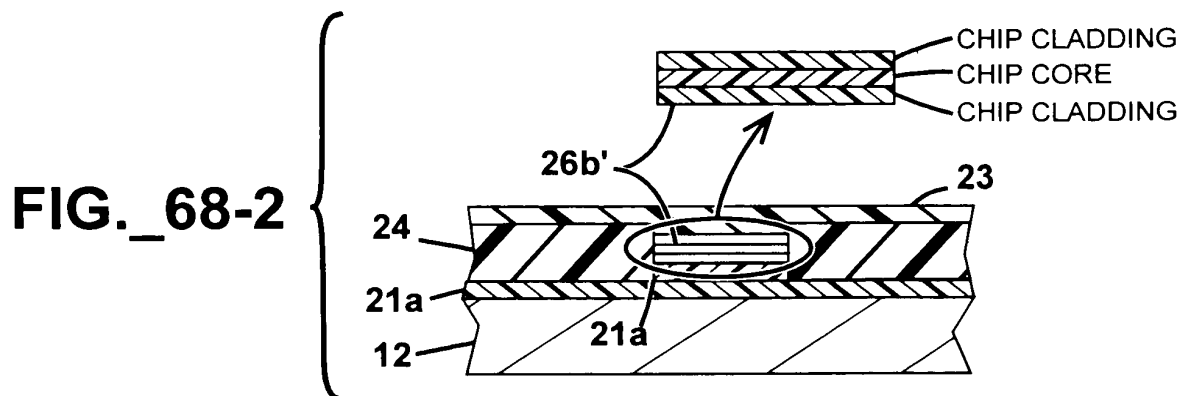


FIG. 67-2



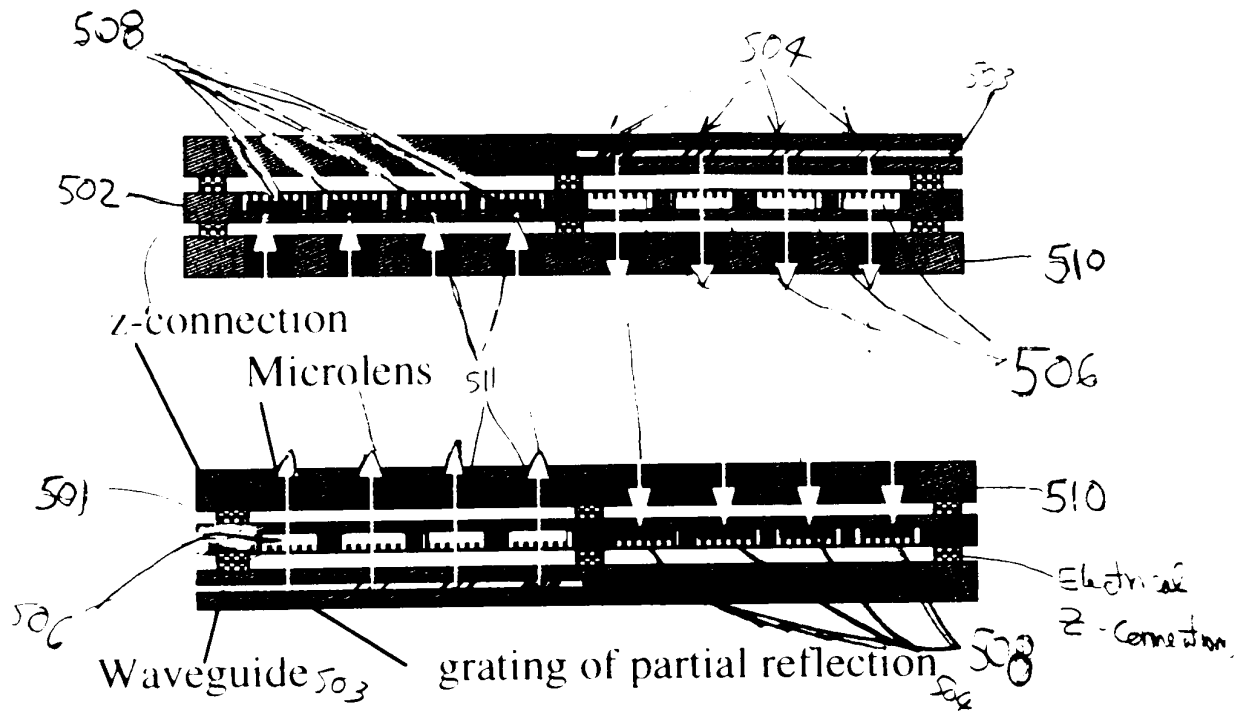


FIG. 69

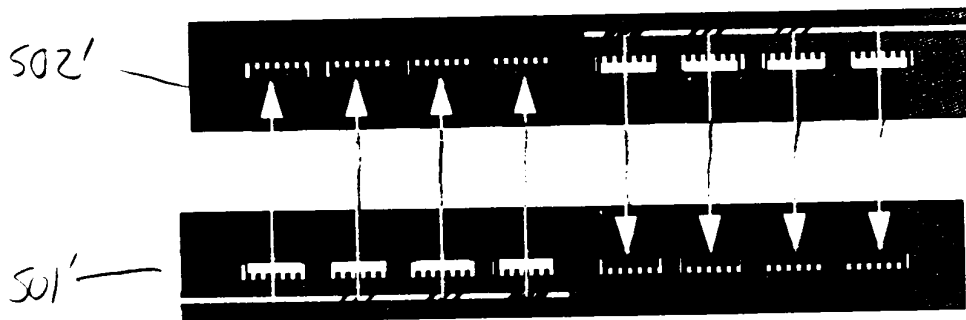


FIG. 70

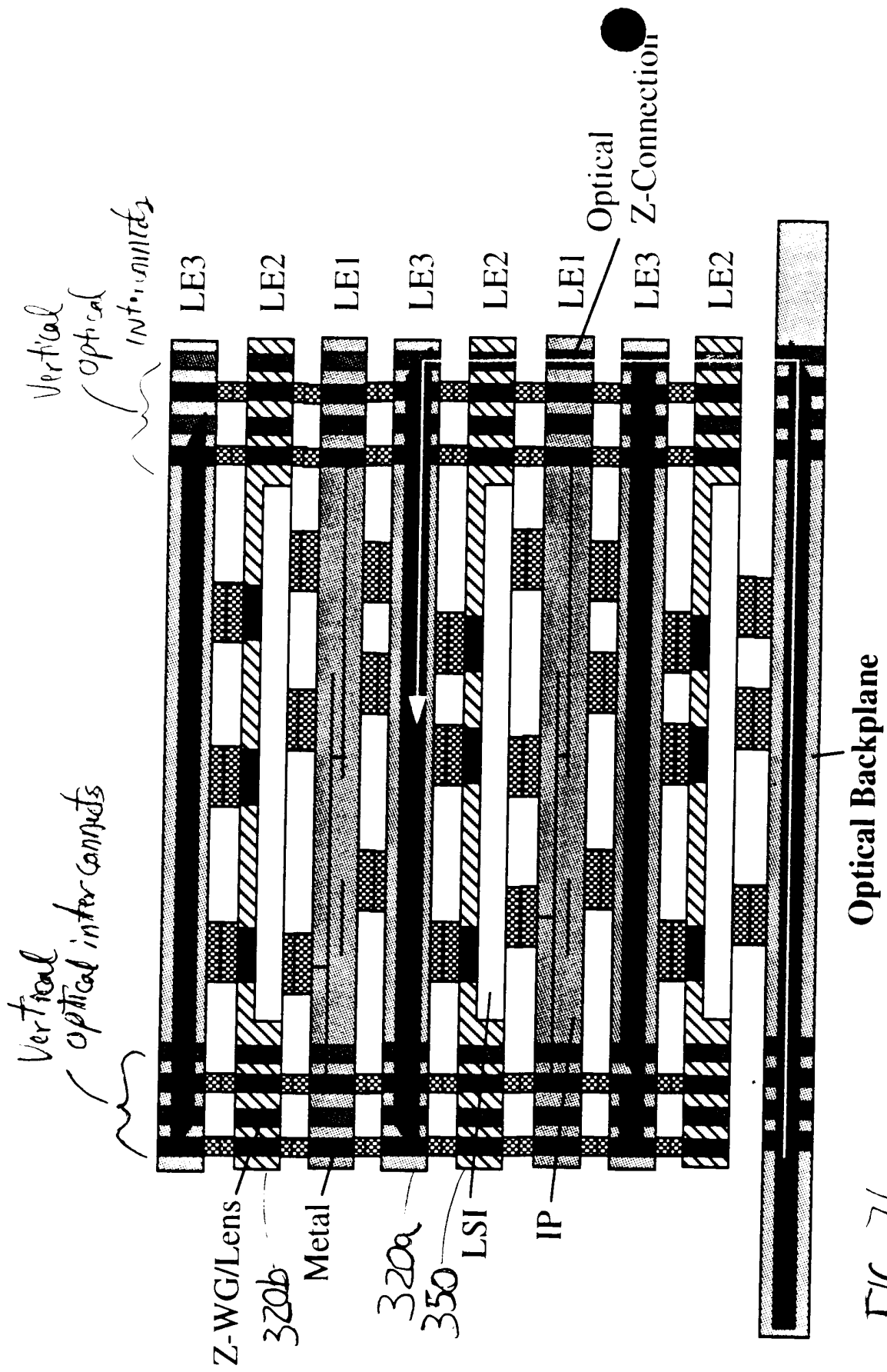


FIG. 71

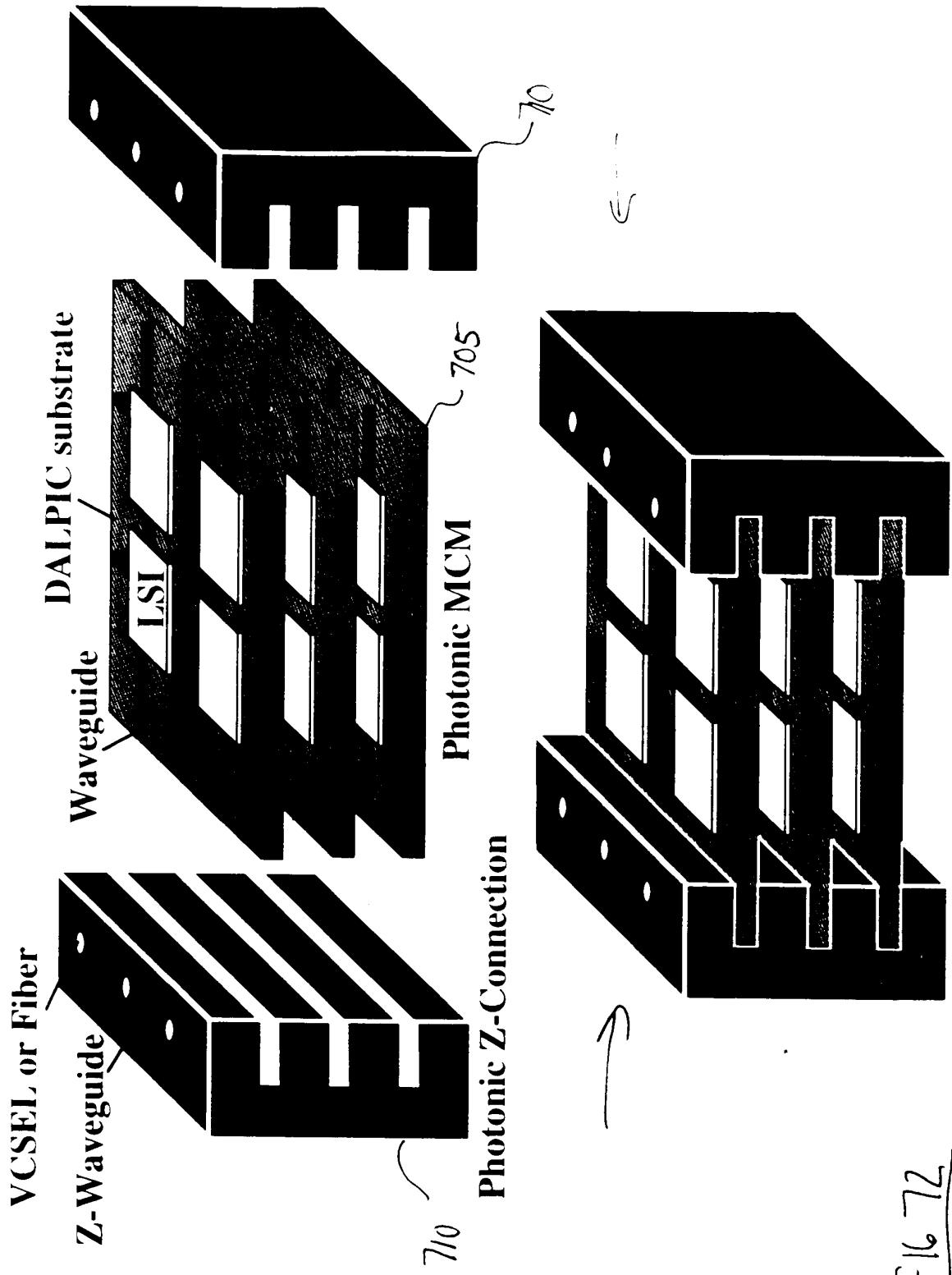
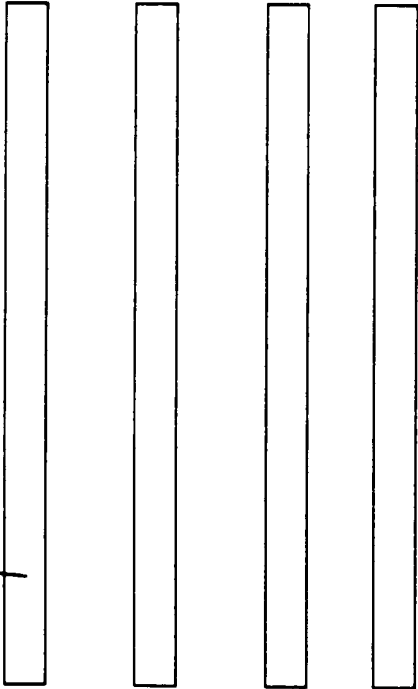
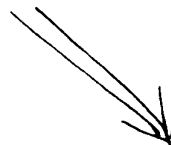
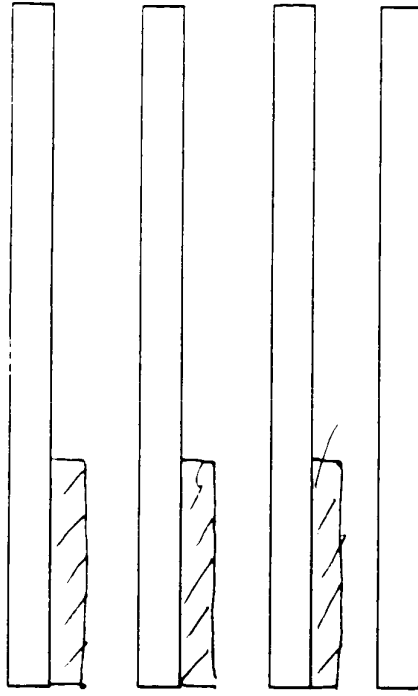


FIG 72

Flexible Photo-imagable sheet (Polyguide)



Bonding sheet attach



Exposure

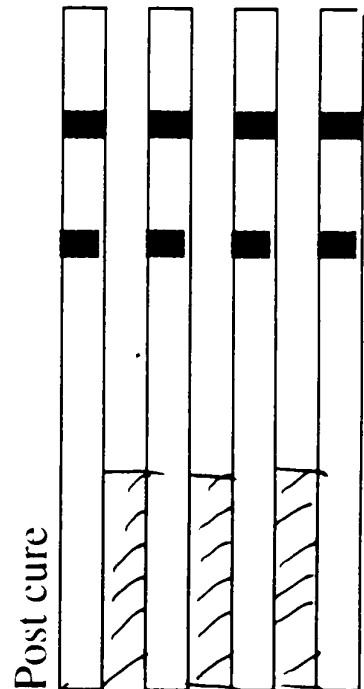
SOLNET process



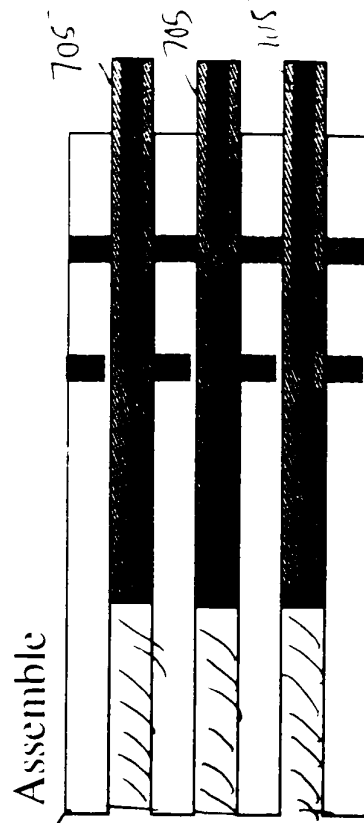
710



Post cure



Assemble



710

705

705

705

FIG. 73

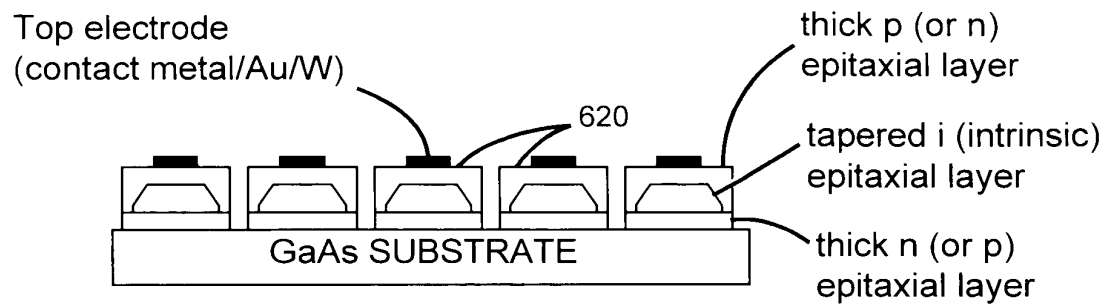


FIG._74 (Epitaxial growth and patterning)

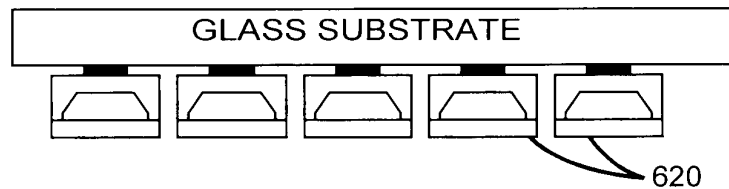


FIG._75 (Epitaxial lift-off)

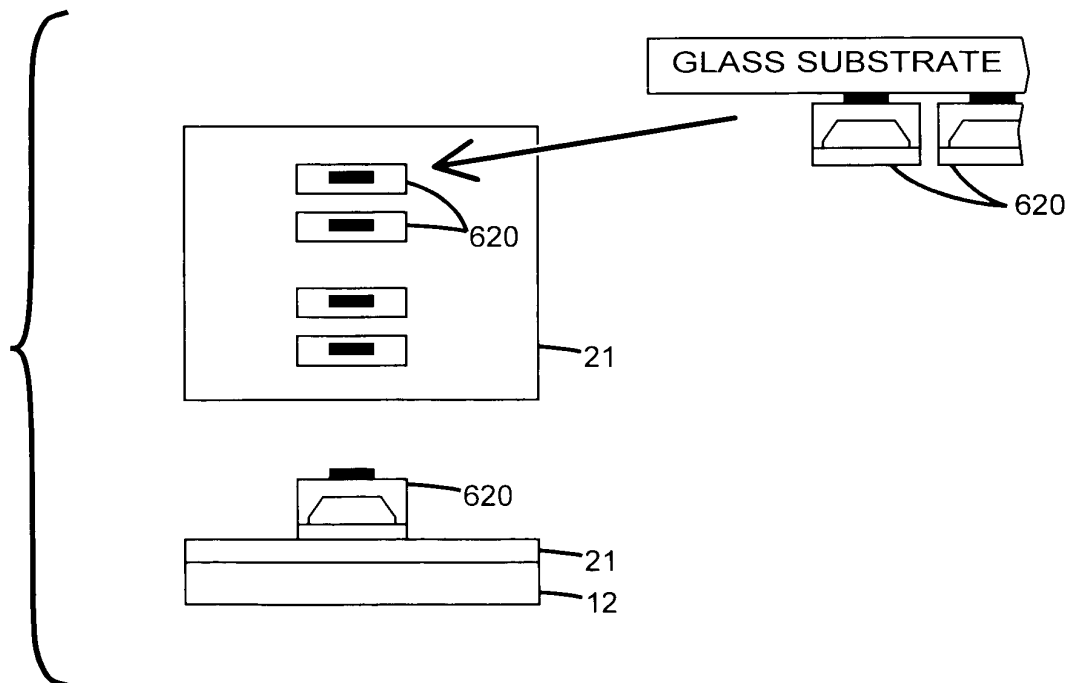


FIG._76 (Transfer)

Example of Light Modulator (or Photodetector) Integration

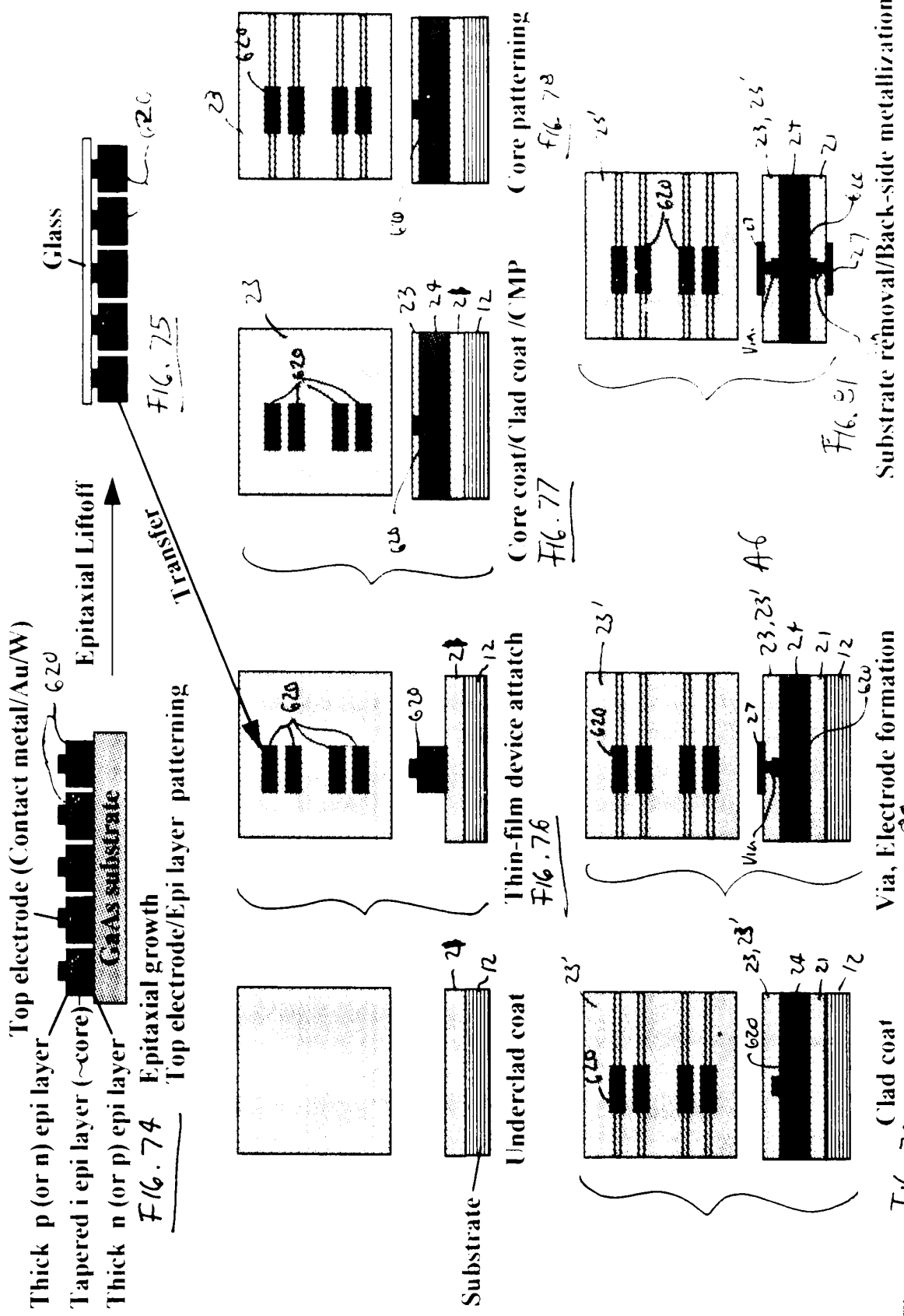


Fig. A6

FIG. 82

Thick p (or n) epi layer
Tapered i epi layer (~core)
Thick n (or p) epi layer
Epitaxial growth
Top electrode (Contact metal/Au/W)
GaAs substrate
Epitaxial Lift-off
Top electrode/patterning, 620'

FIG. 83

Metallization Glass
Device Divide
620'

Transfer

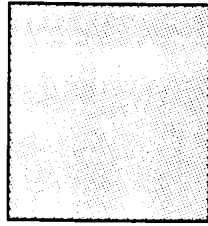


FIG. 84

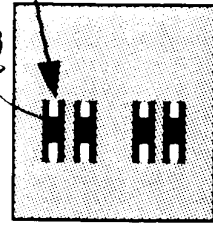


FIG. 85



FIG. 86

Buffer Substrate
Buffer/Underclad coat/Metallization
620'

Thin-film device attach
620'

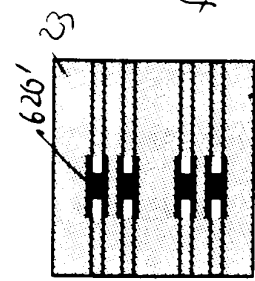


FIG. 87

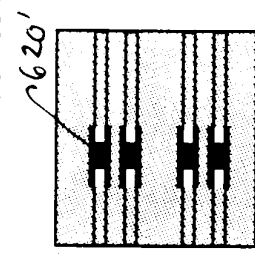
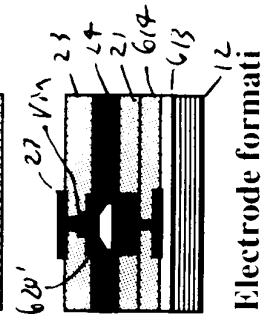
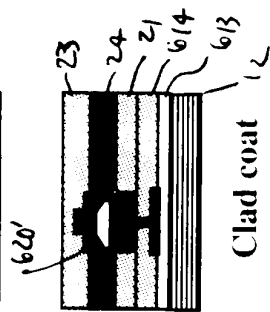


FIG. 88



Via, Electrode formation

FIG. 89



Clad coat

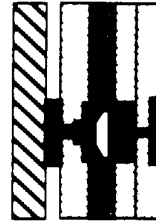


FIG. 91

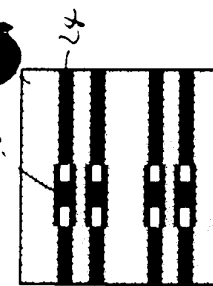


FIG. 92

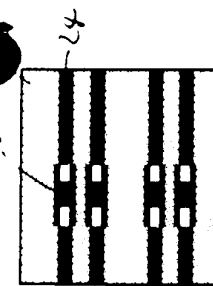
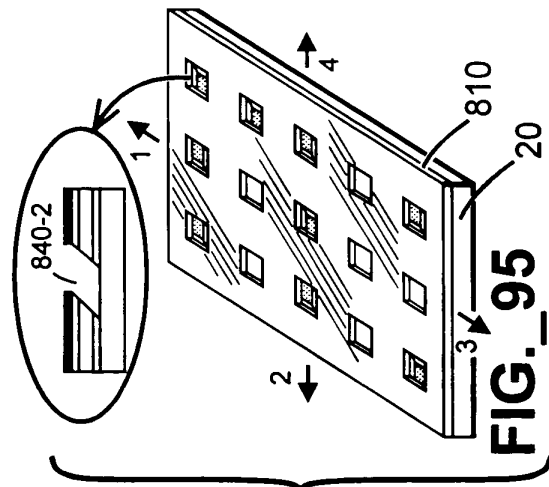
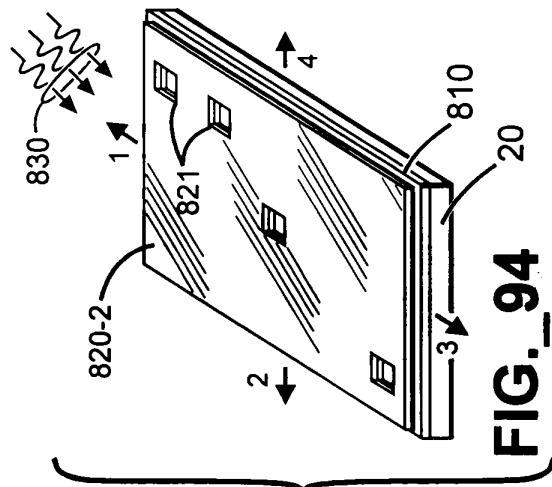
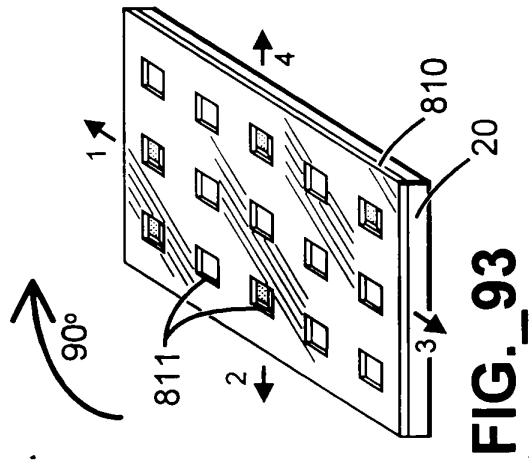
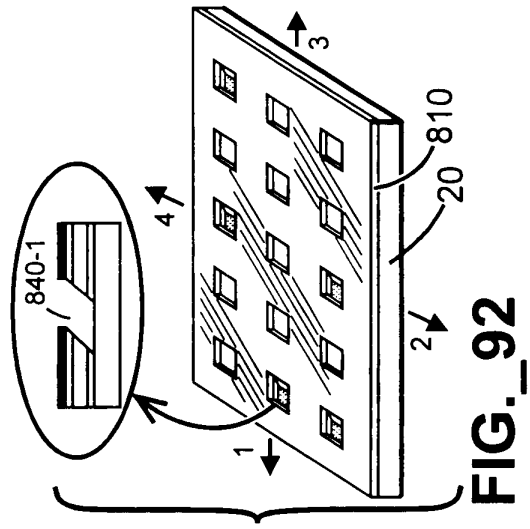
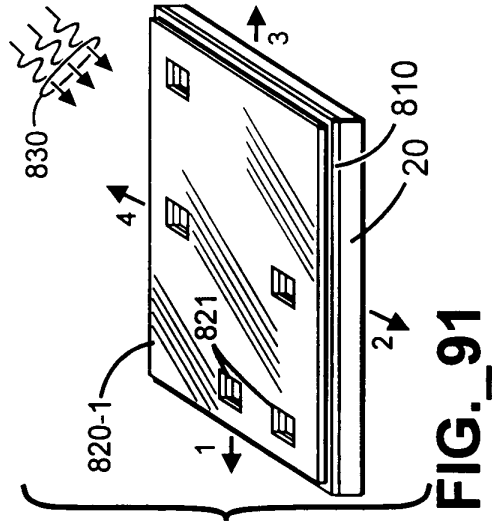
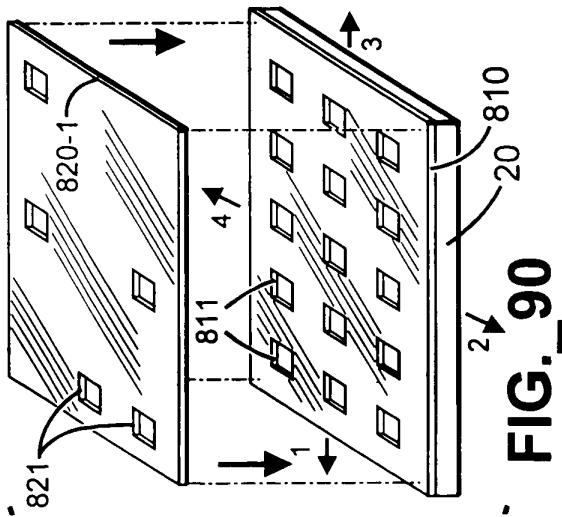


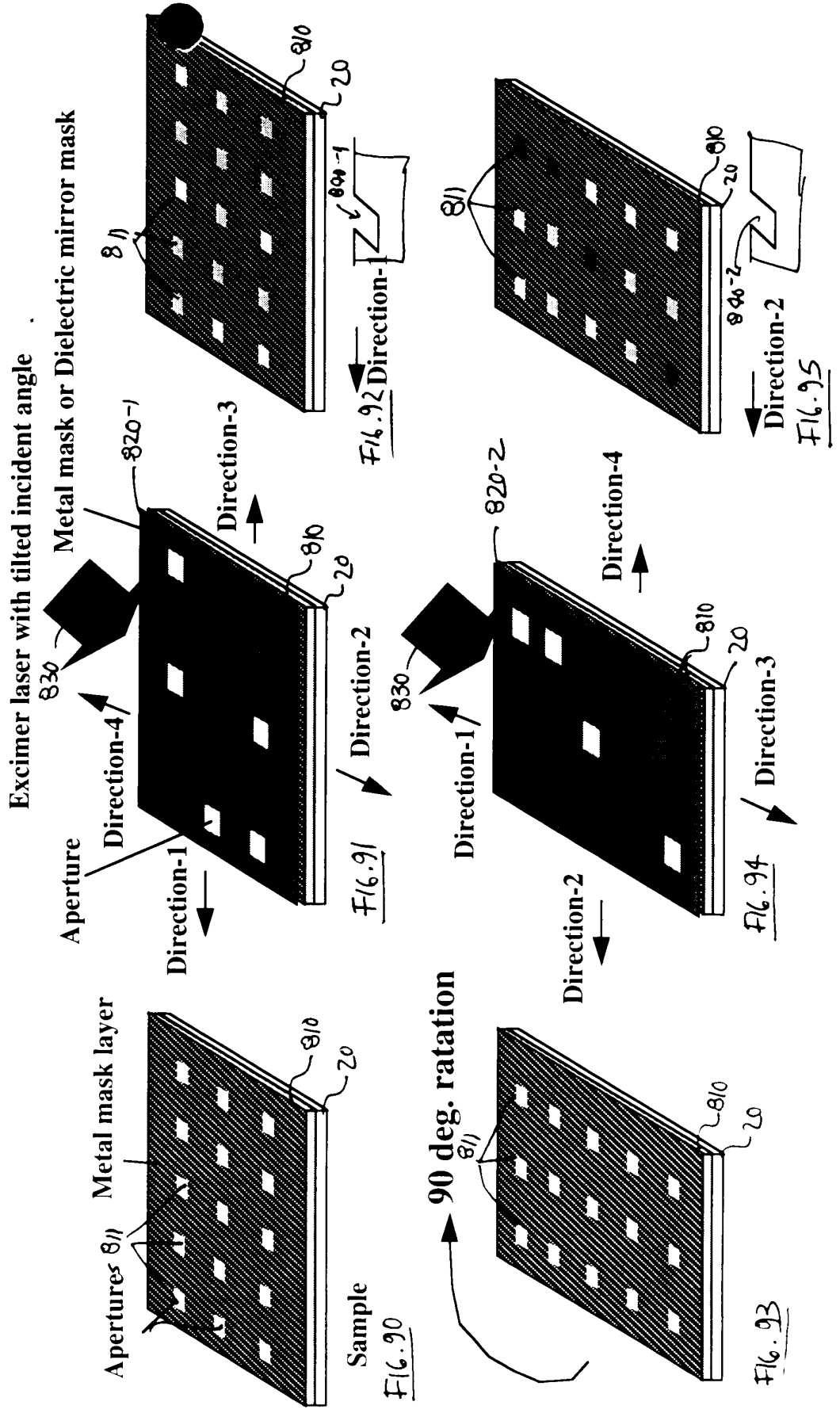
FIG. 93

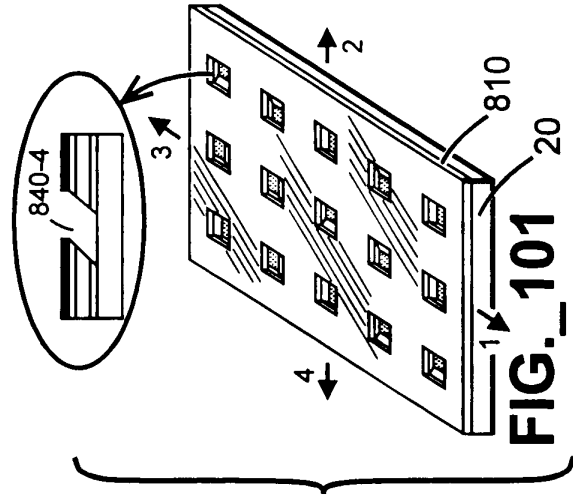
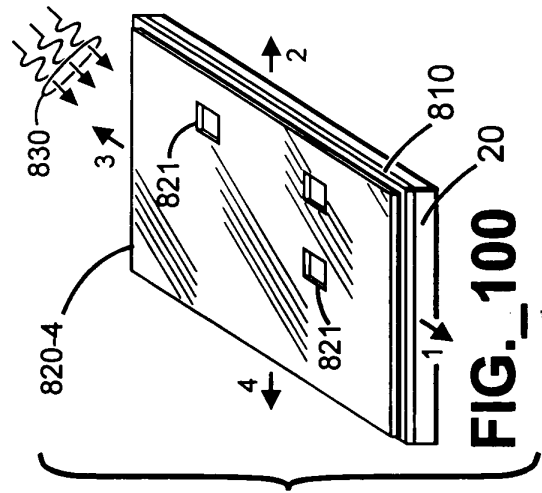
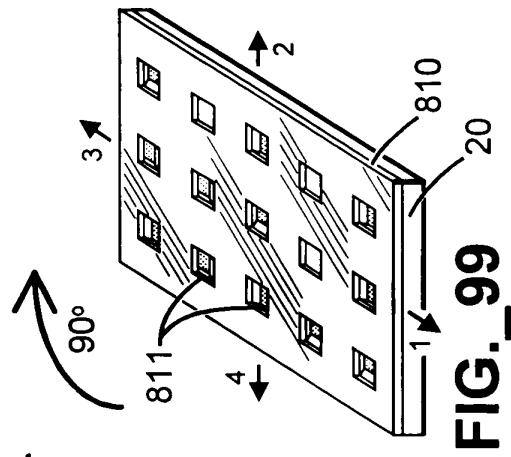
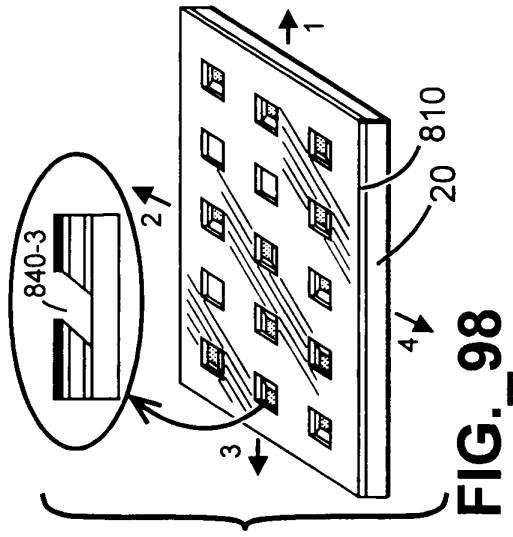
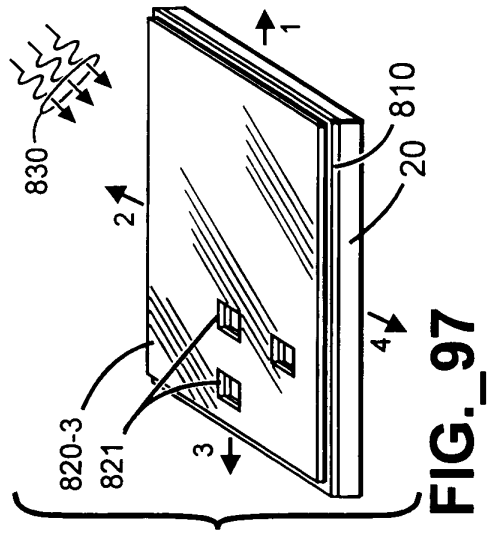
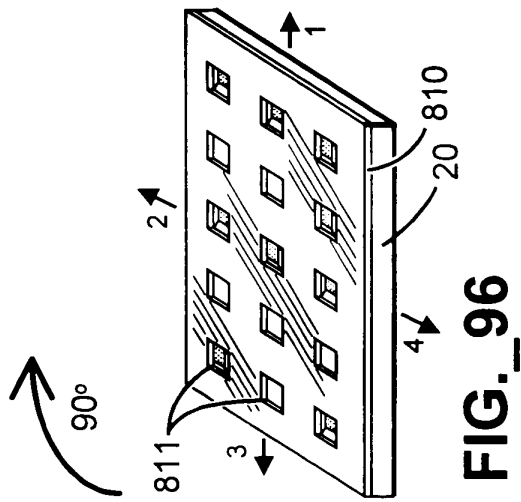


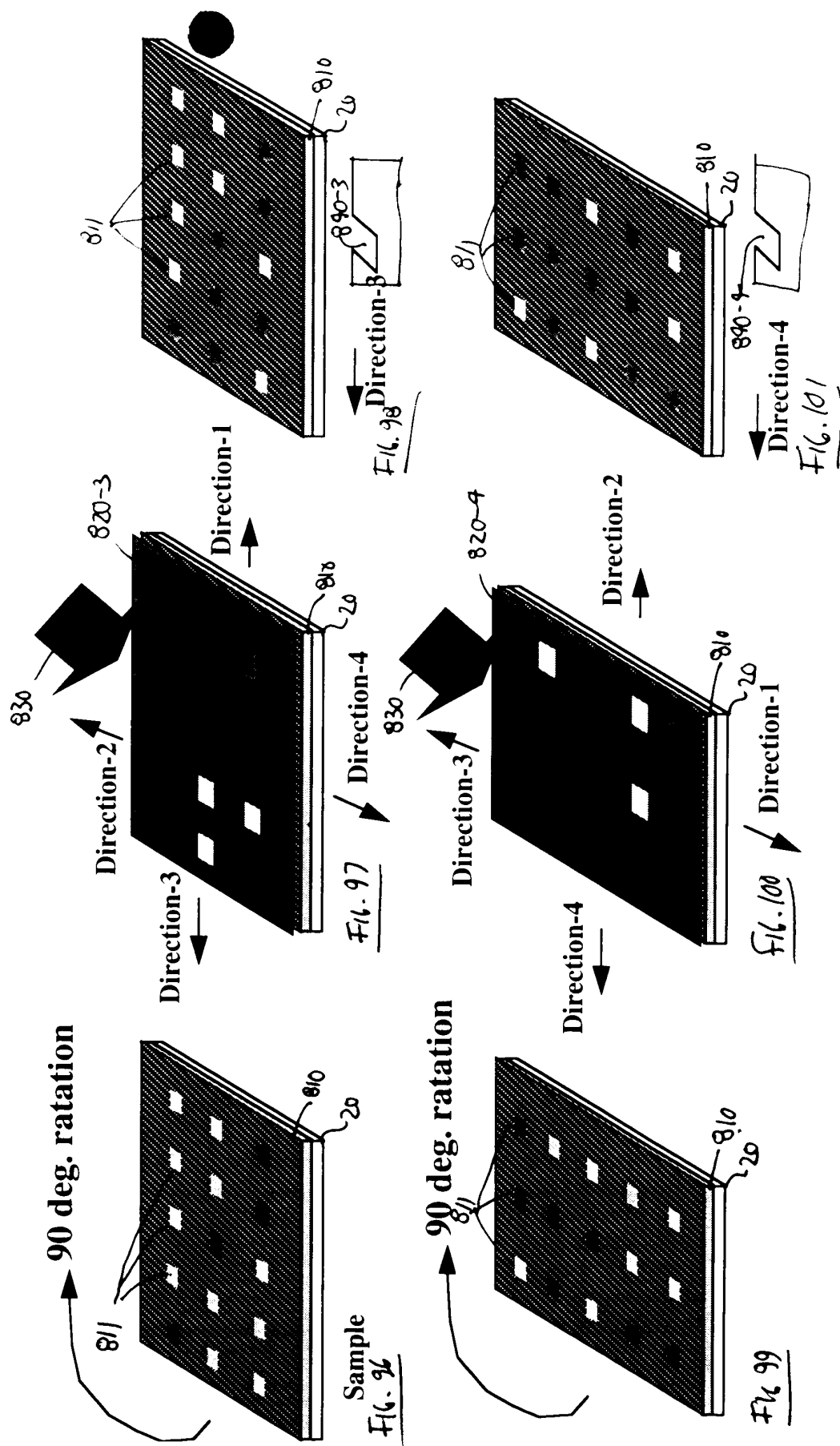
Clad/Core coat

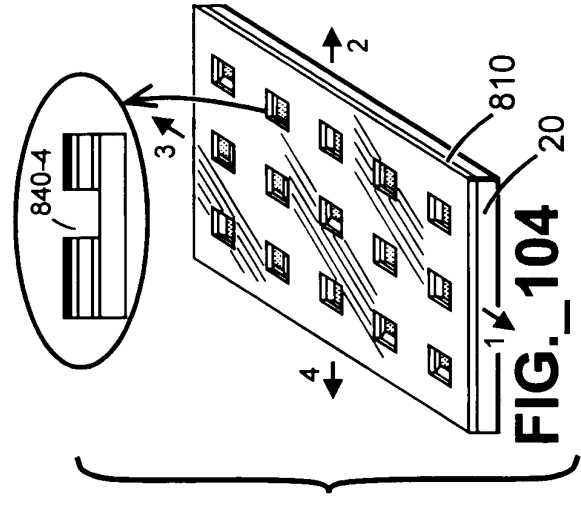
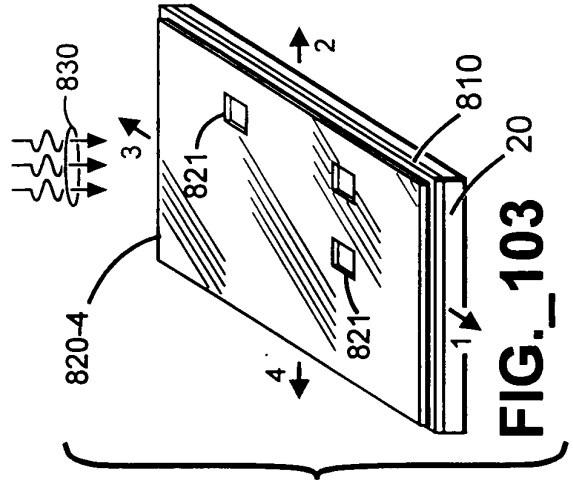
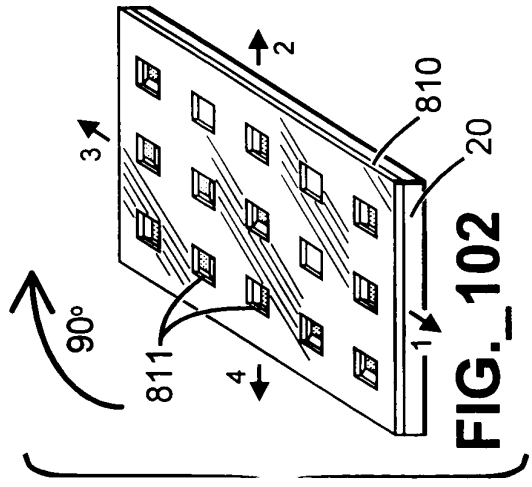
Core patterning



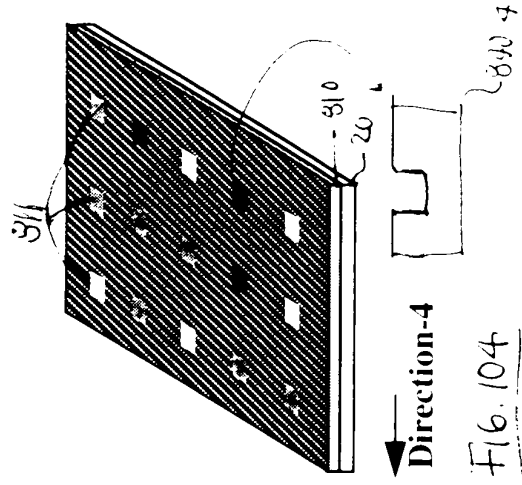
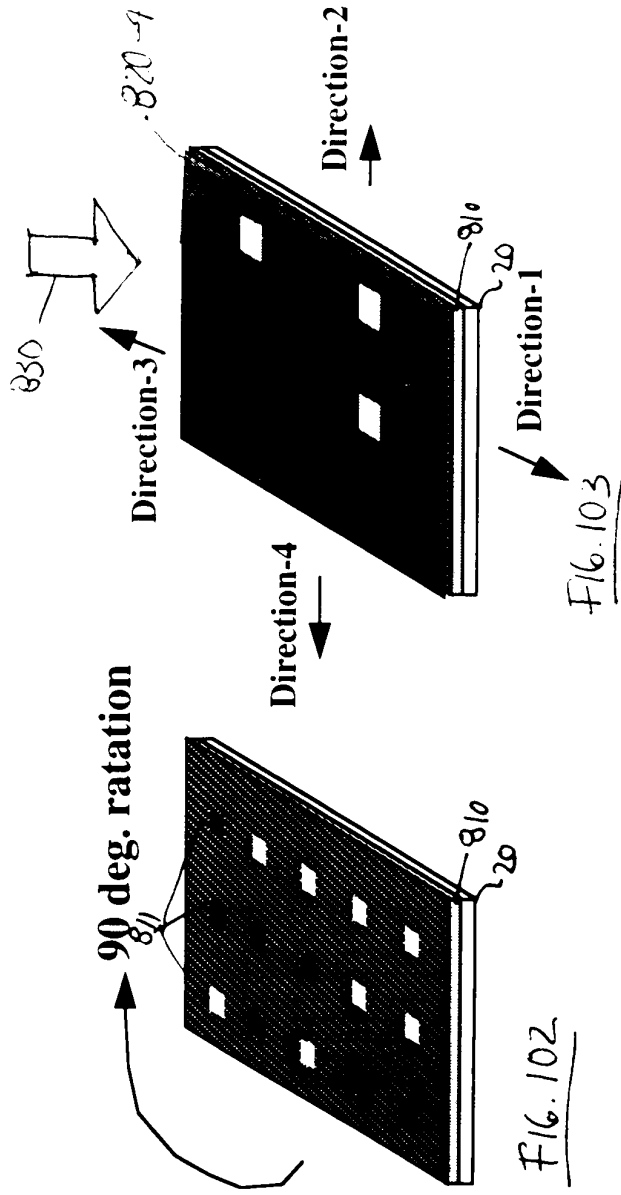


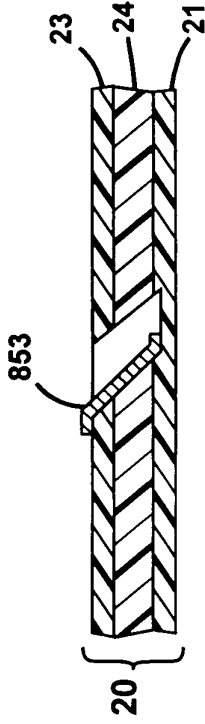
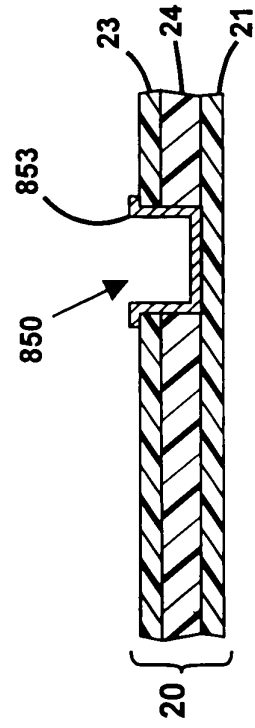
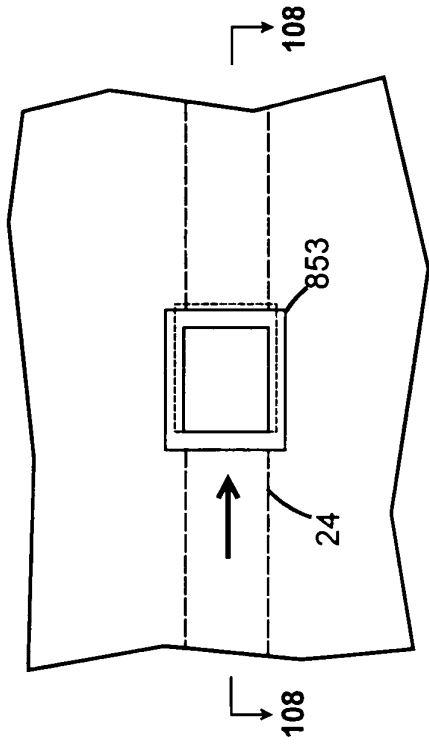
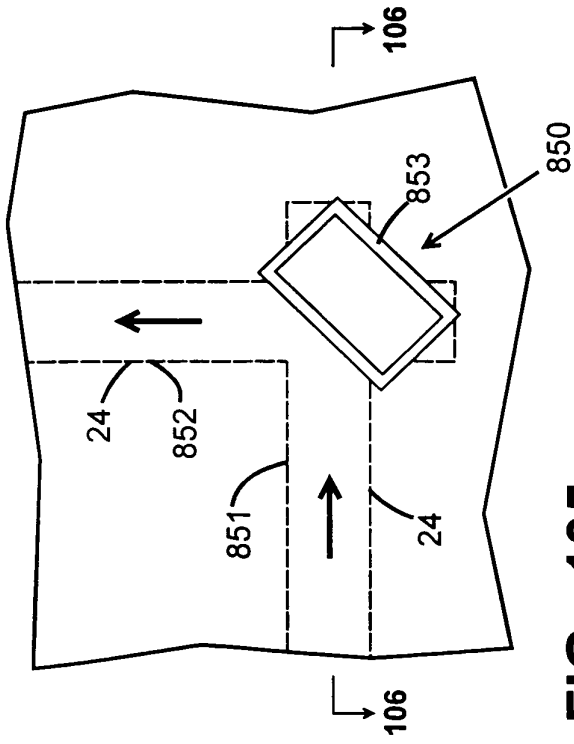






90 deg. rotation





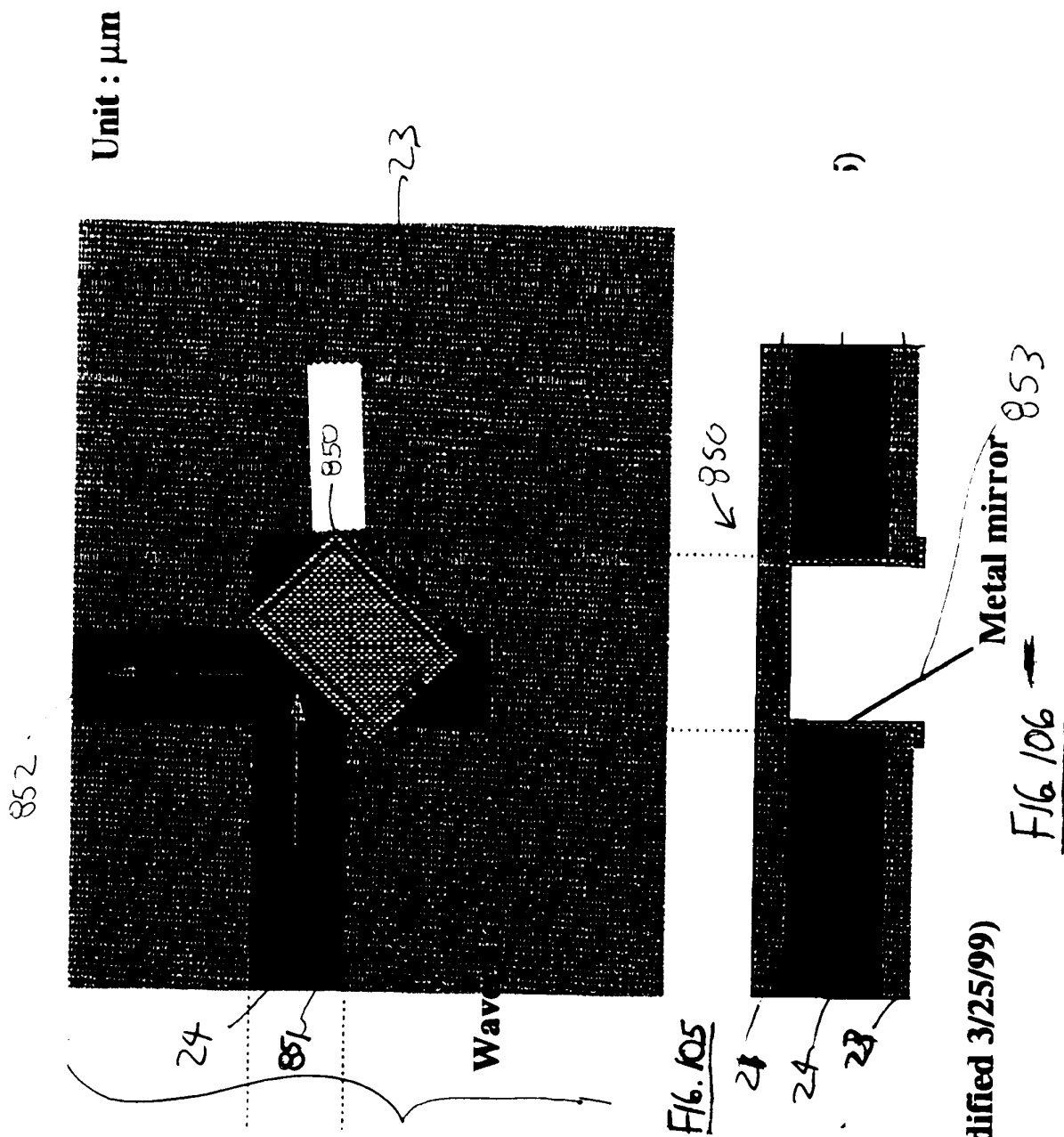


Fig. 3/24/99-1 (Modified 3/25/99)

cl 3/25/99

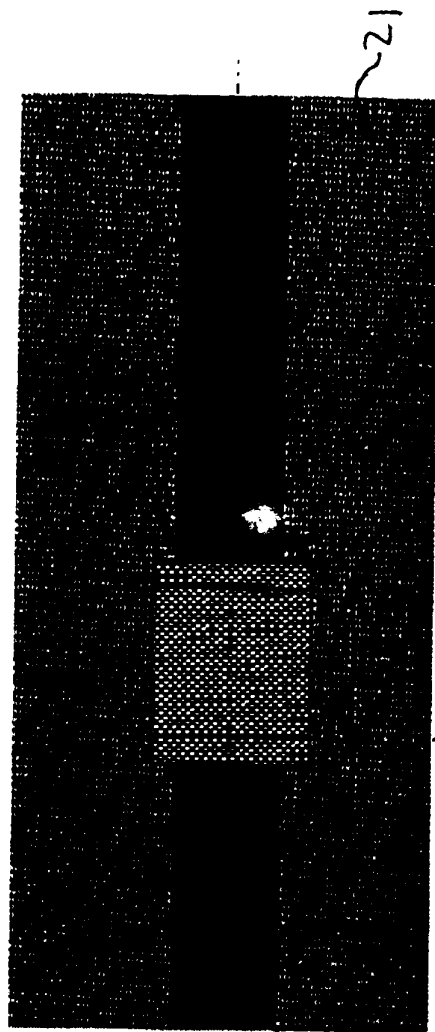


FIG. 107

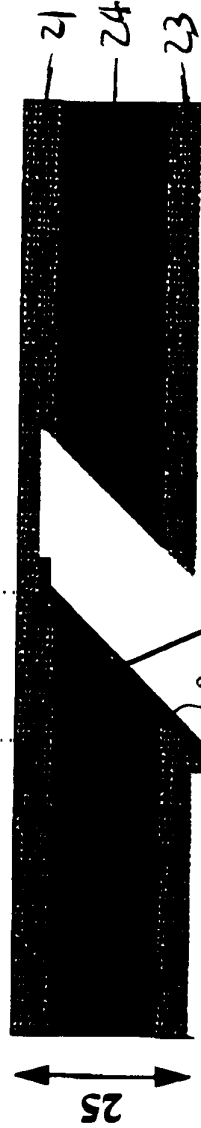


FIG. 108

Metal mirror

GS CX/CXX OE Solution --- OE-3D-Stack

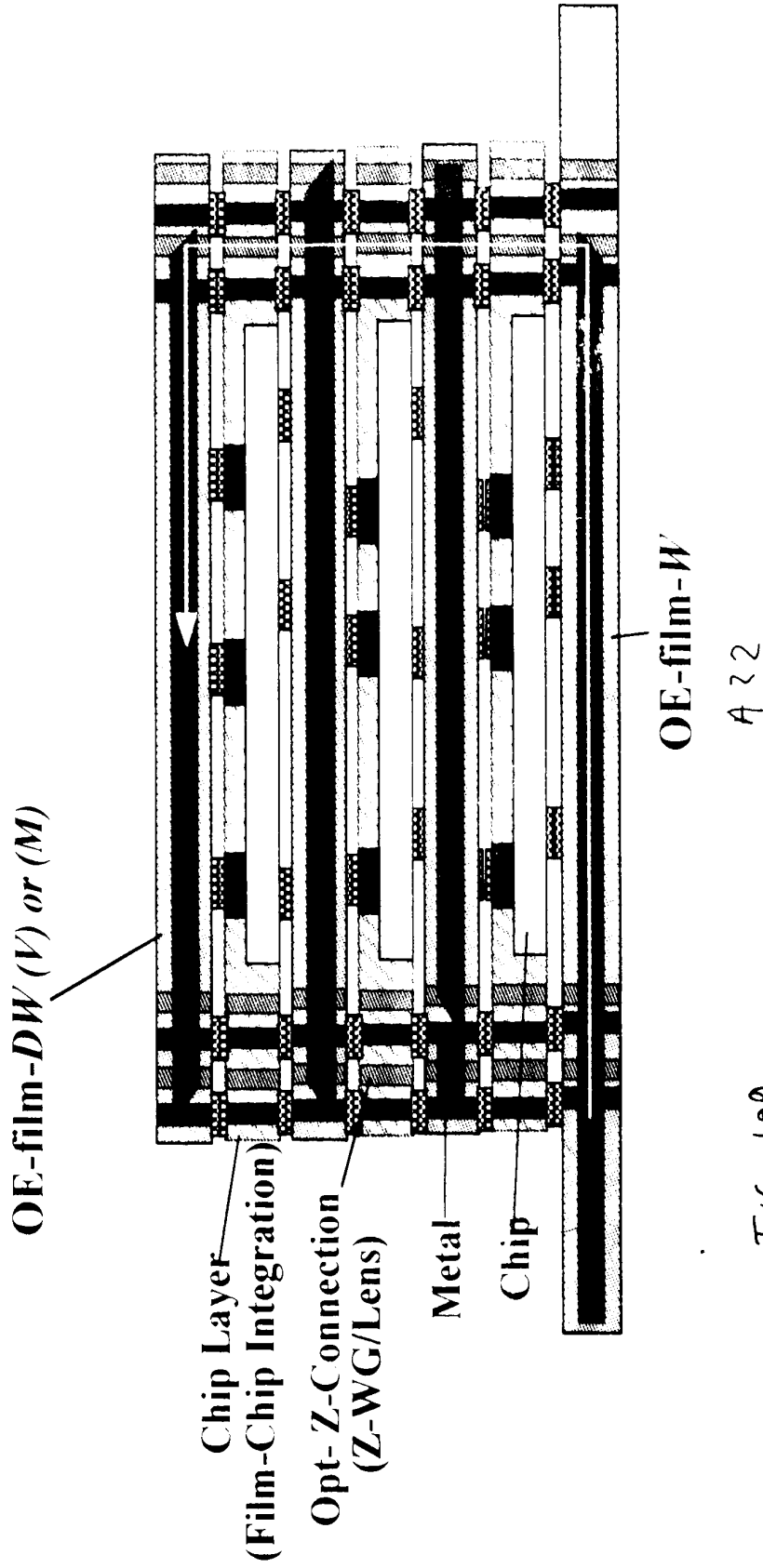
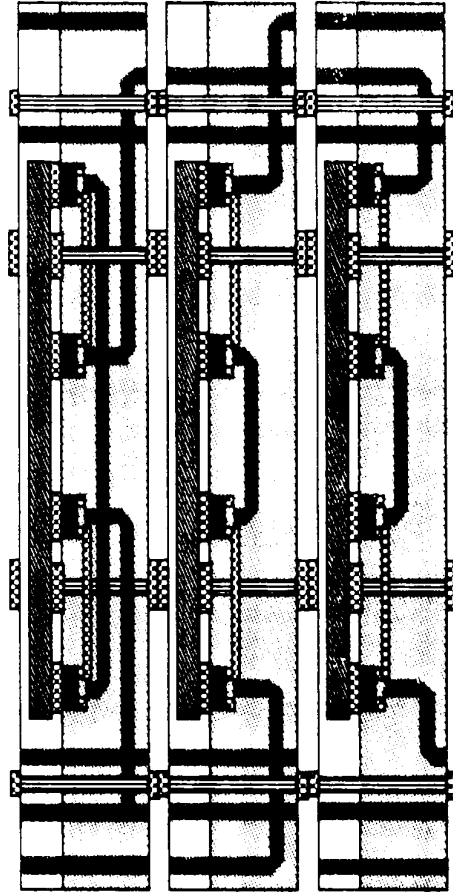
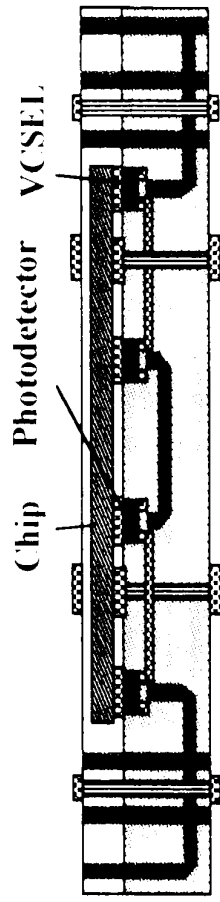


FIG. 109

2/23/99-added 7

Figure 12-1

A 22 3/7/99



F16.110

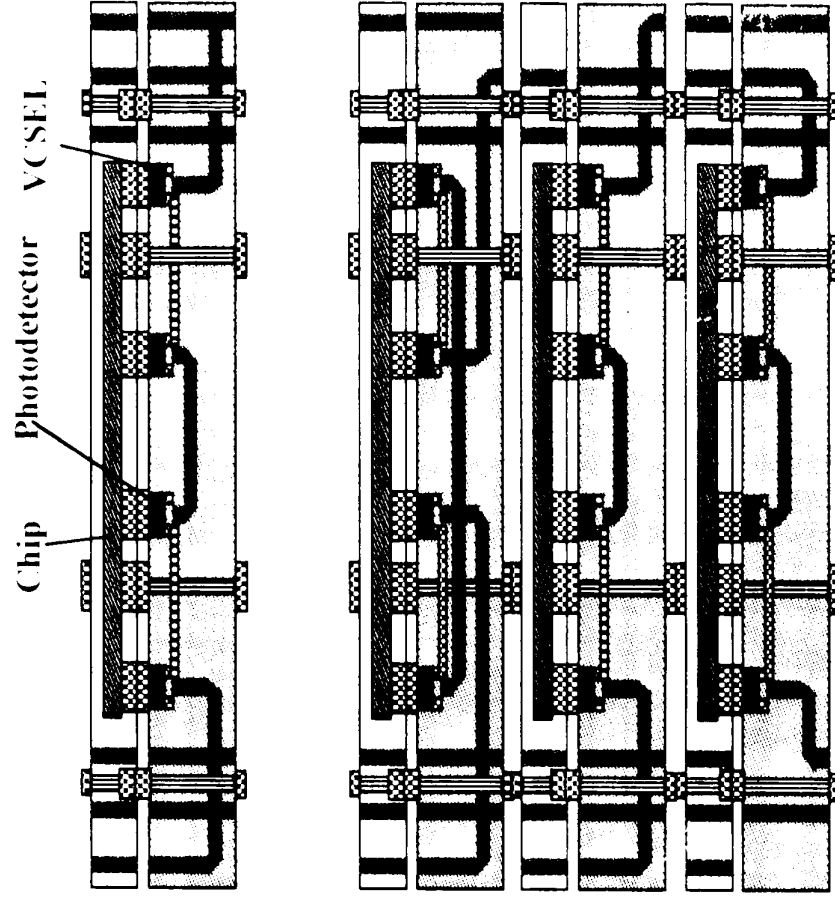
A23

(2/23/99) AA1 Detail picture Example for 3D-stack'

(New version of the AA1 of 2/5/99)

Figure 12-2'

A 23 3/7/99



F16.110

(2/23/99) AA2 Detail picture Example for 3D-stack'

(New version of the AA2 of 2/5/99)

A24

A24 3/7/99

Figure 12-3'

Film/Z-Connection Application to OE-Substrate

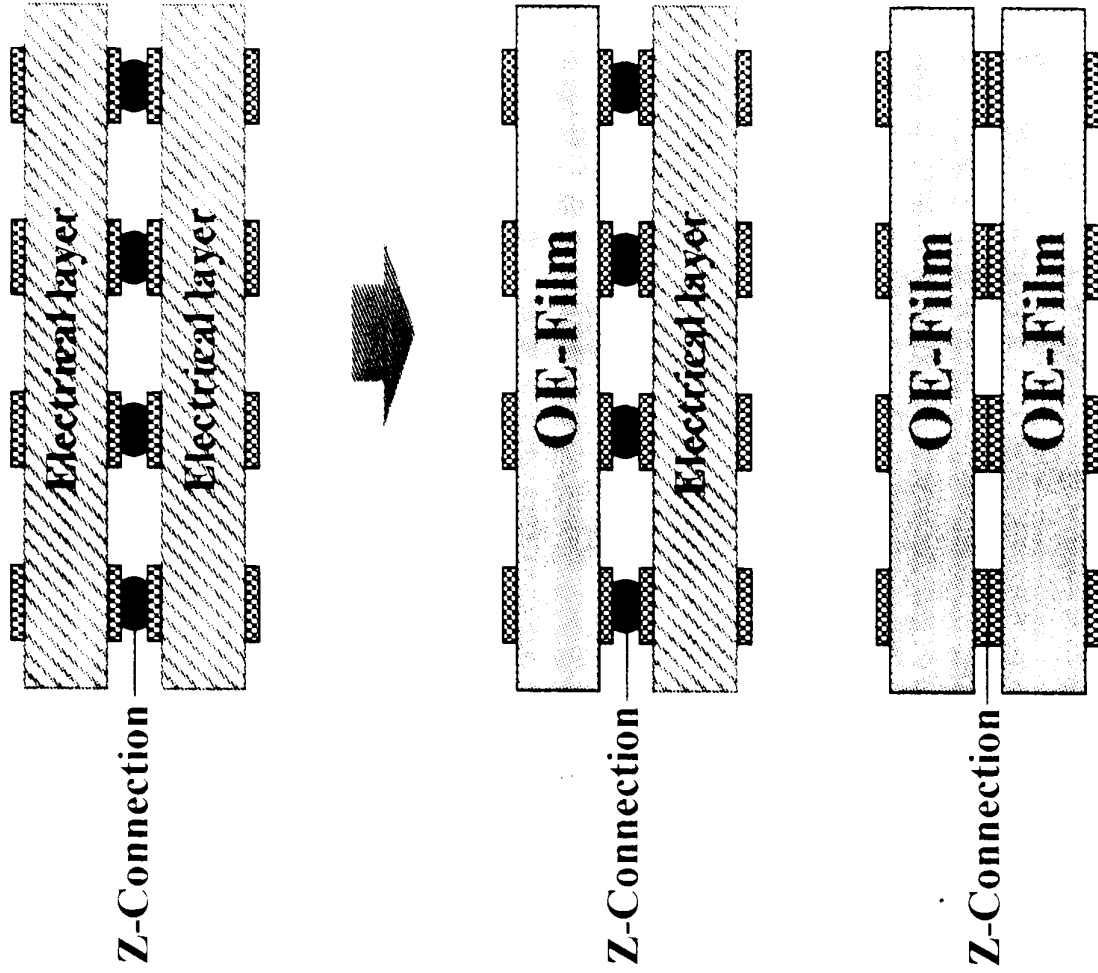


Fig. 1/2

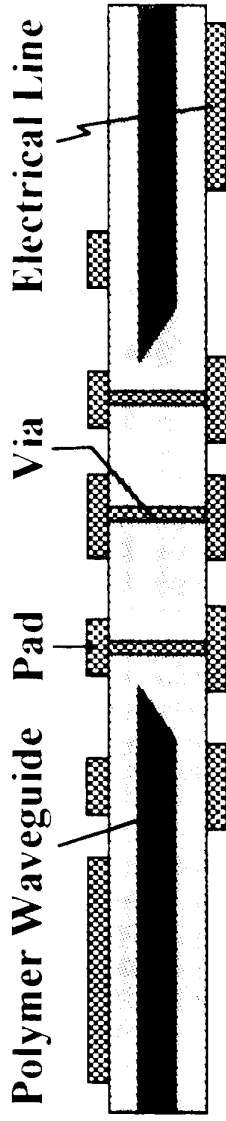
A7

2/23/99-added 1

Figure 1

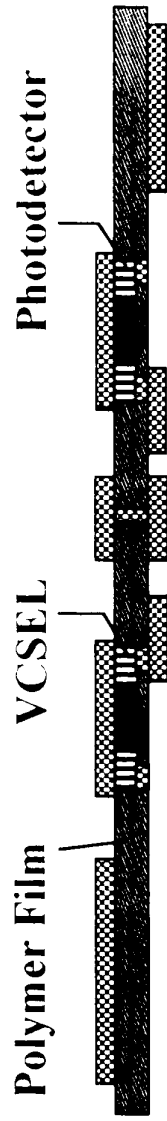
A7 3/2/99

OE-Films



OE-film-W

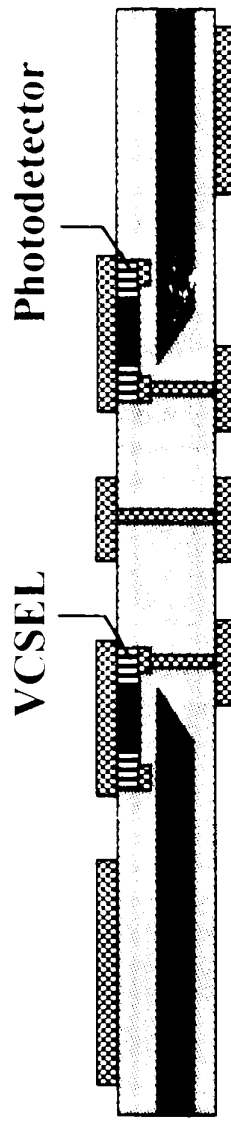
F16.113



OE-film-D

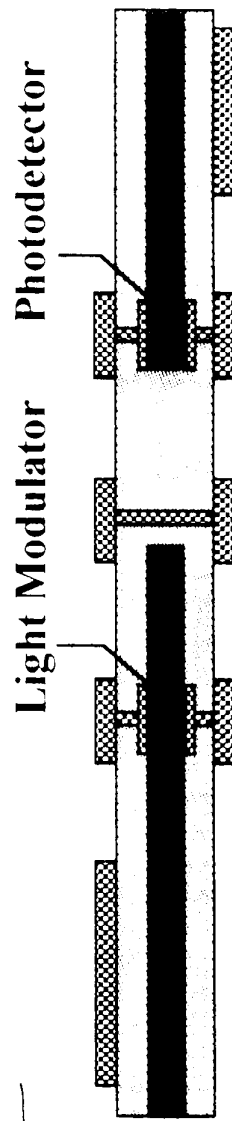
F16.114

A8



OE-film-DW(V)

F16.115



OE-film-DW(M)

2/17/99-added 2

F16.116

A8 3/27/99

FOLM

Fiber Array
Image Guide
Waveguide Array

OE-Film-DW (V)

Connector

VCSEL

Chip

Photodetector

Chip

Connector

Intgr type

Electrical-MCM

Electrical Board

Fig. 117

A 9

Z-connection

OE-Film-D

OE-Film-W

Chip

Chip

IP-type

Z-connection

Electrical-MCM

Electrical Board

(2/23/99) Fig. New-44 Modified
divided 1/4

Figure 3-1

Fig. 118

A 9 3/27/99

FOLM

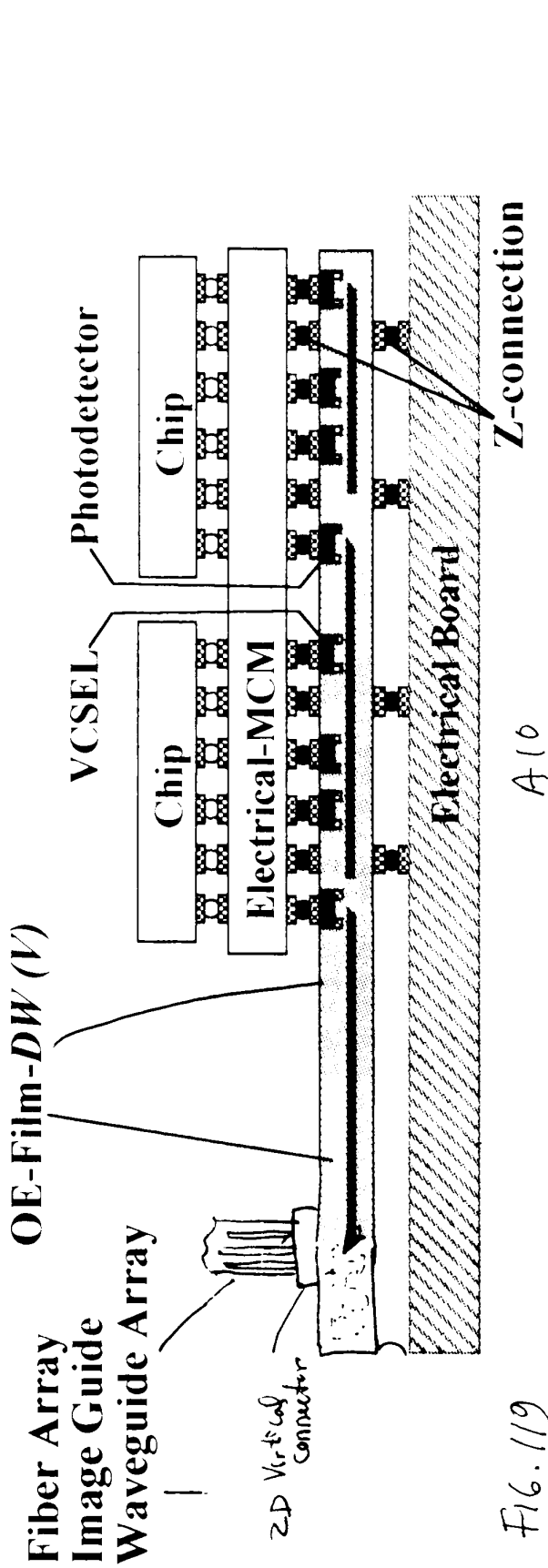
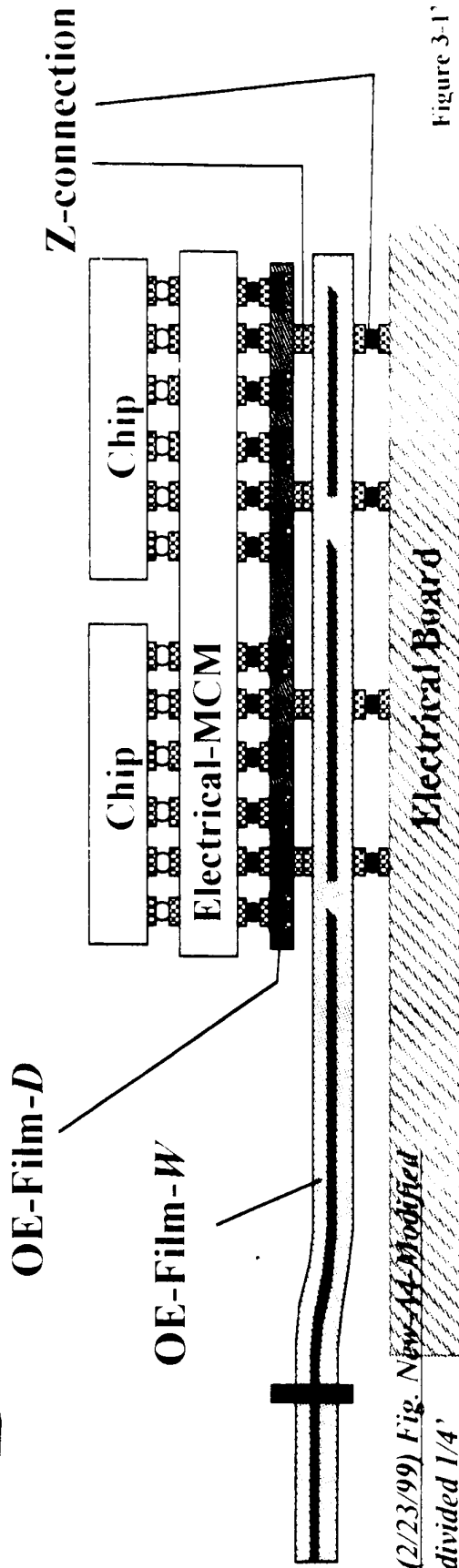


Fig. 119



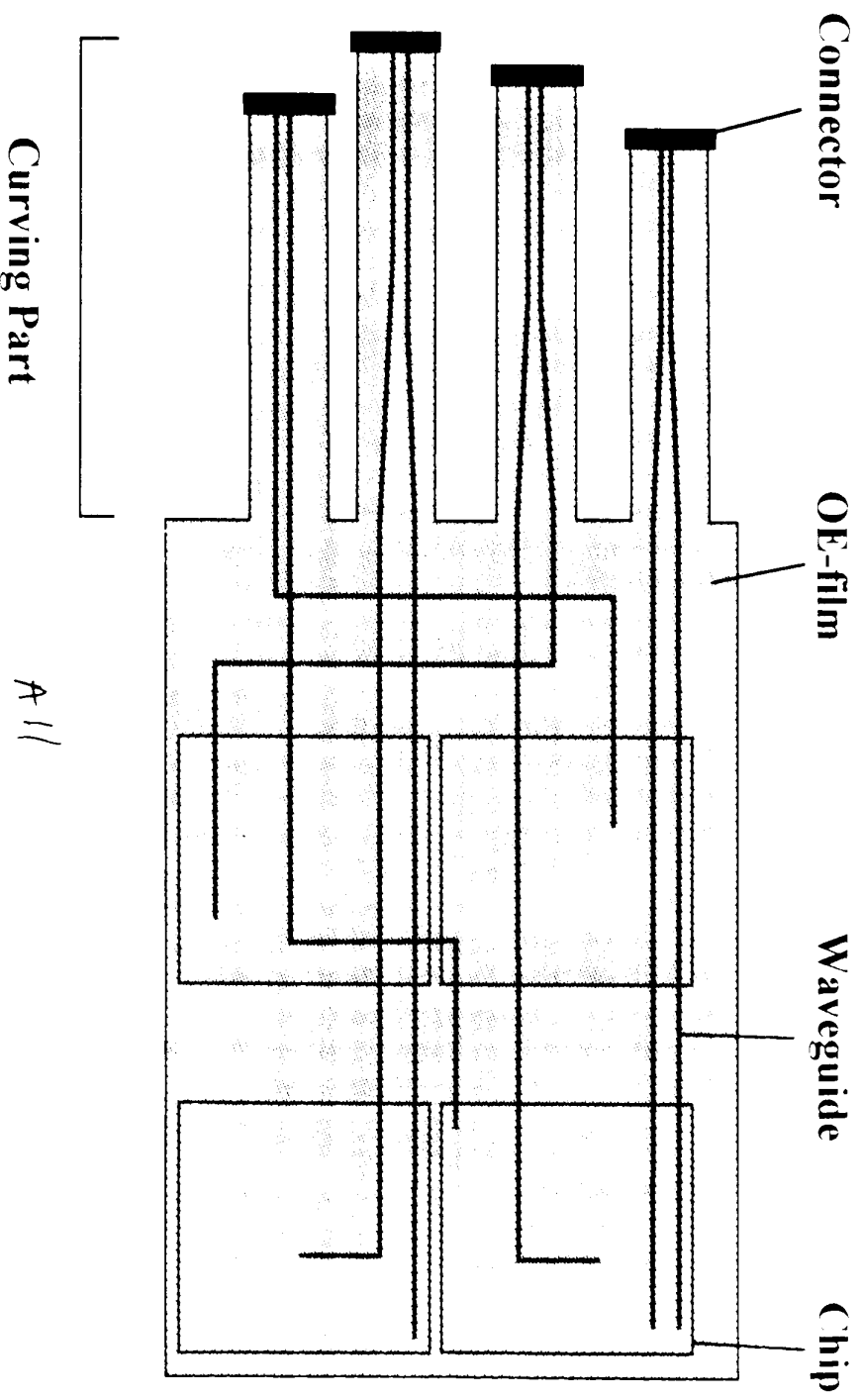
(2/23/99) Fig. New-A4-Modified
divided 1/4'

Figure 3-1'

Fig. 120

A10 3/27/99

FOLM with Optical Path Length Controller, Connector Buffer



(2/17/99) Fig. New-A4-Modified
divided 2/4

FIG. 121

A11 3/2/99

Figure 3-2

FOLM with Optical Path Length Controller, Connector Buffer

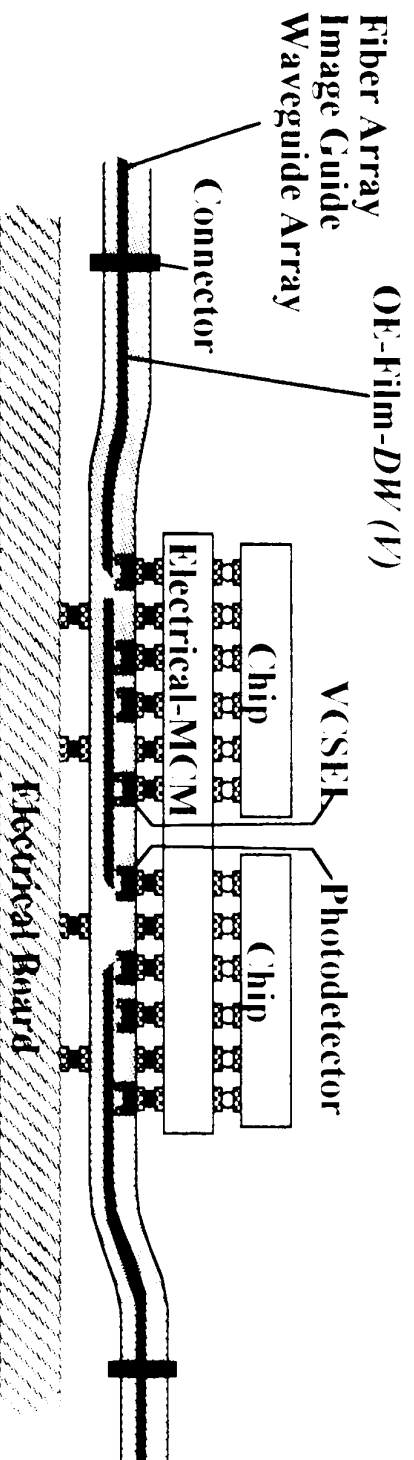


Fig. 123

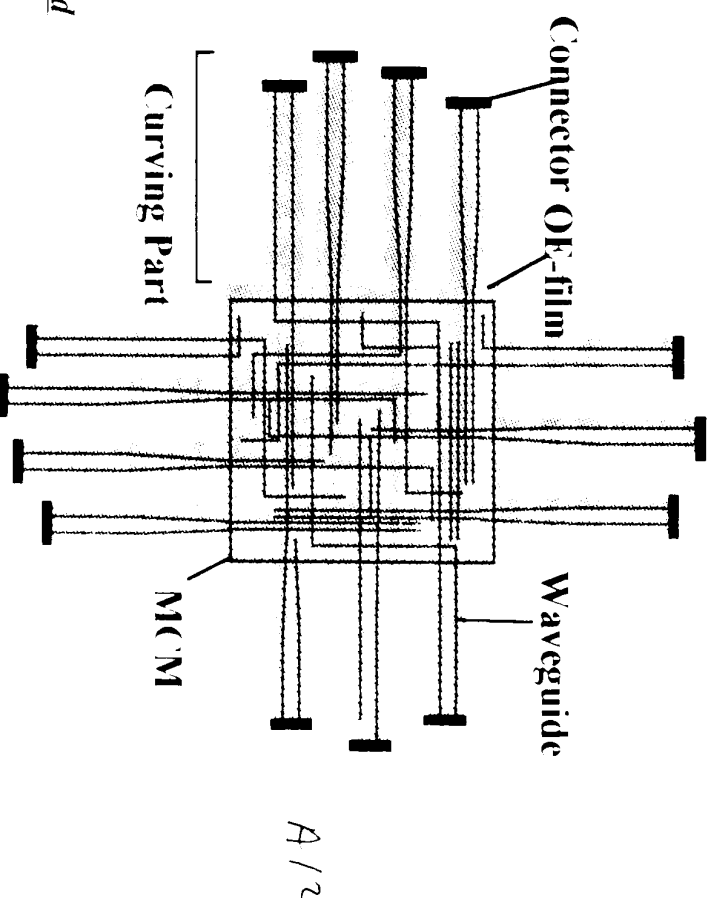


Fig. 122

(2/23/99) Fig. New-A4-Modified
divided 2/4'

Figure 3-2'

FOLM with 2D Waveguide Connector

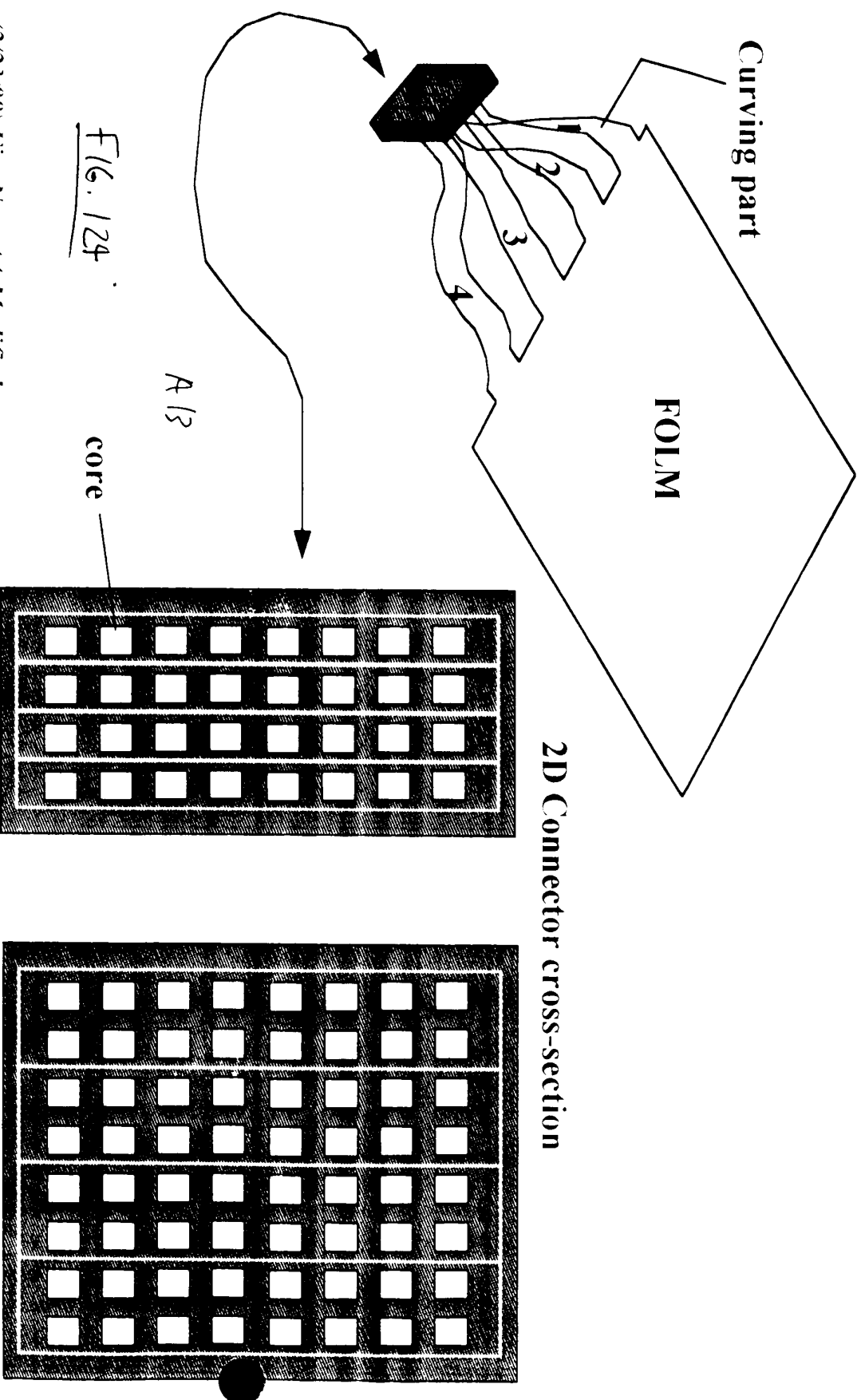


FIG. 124

(2/23/99) Fig. New-A4-Modified
divided 3/4'

(for Single-layer waveguide) (for 2-layer waveguide) Figure 3-3'

A 13 3/7/99

FOLM: High-Speed Option

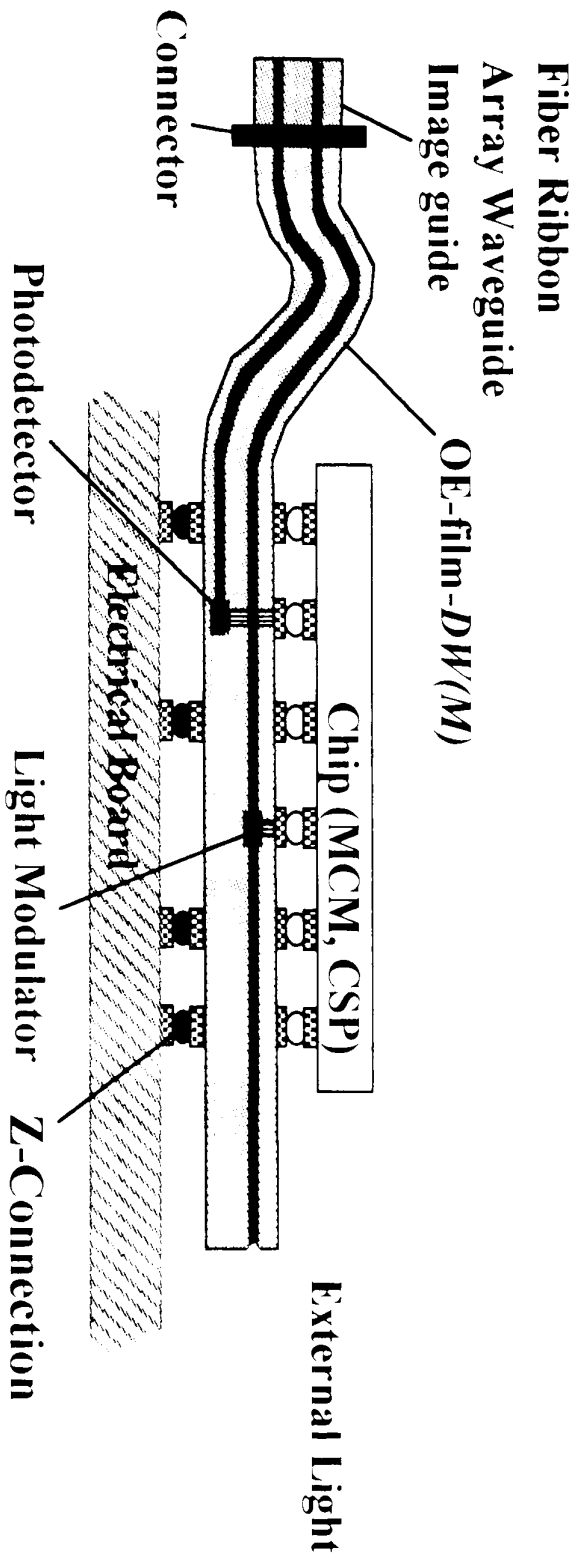


Fig. 125

A 14

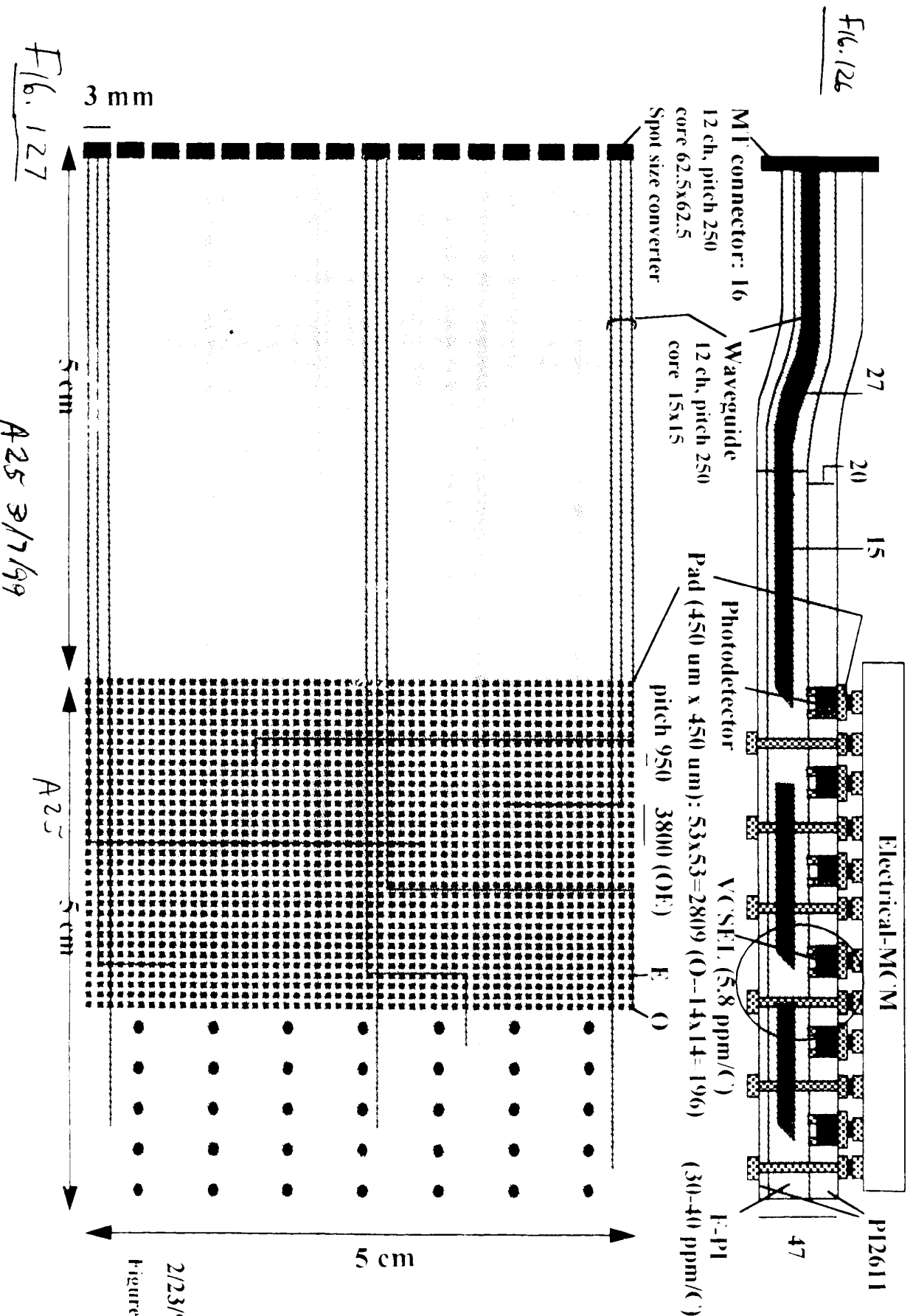
(2/17/99) Fig. New-A4-Modified
divided 4/4

A 14 3/7/99

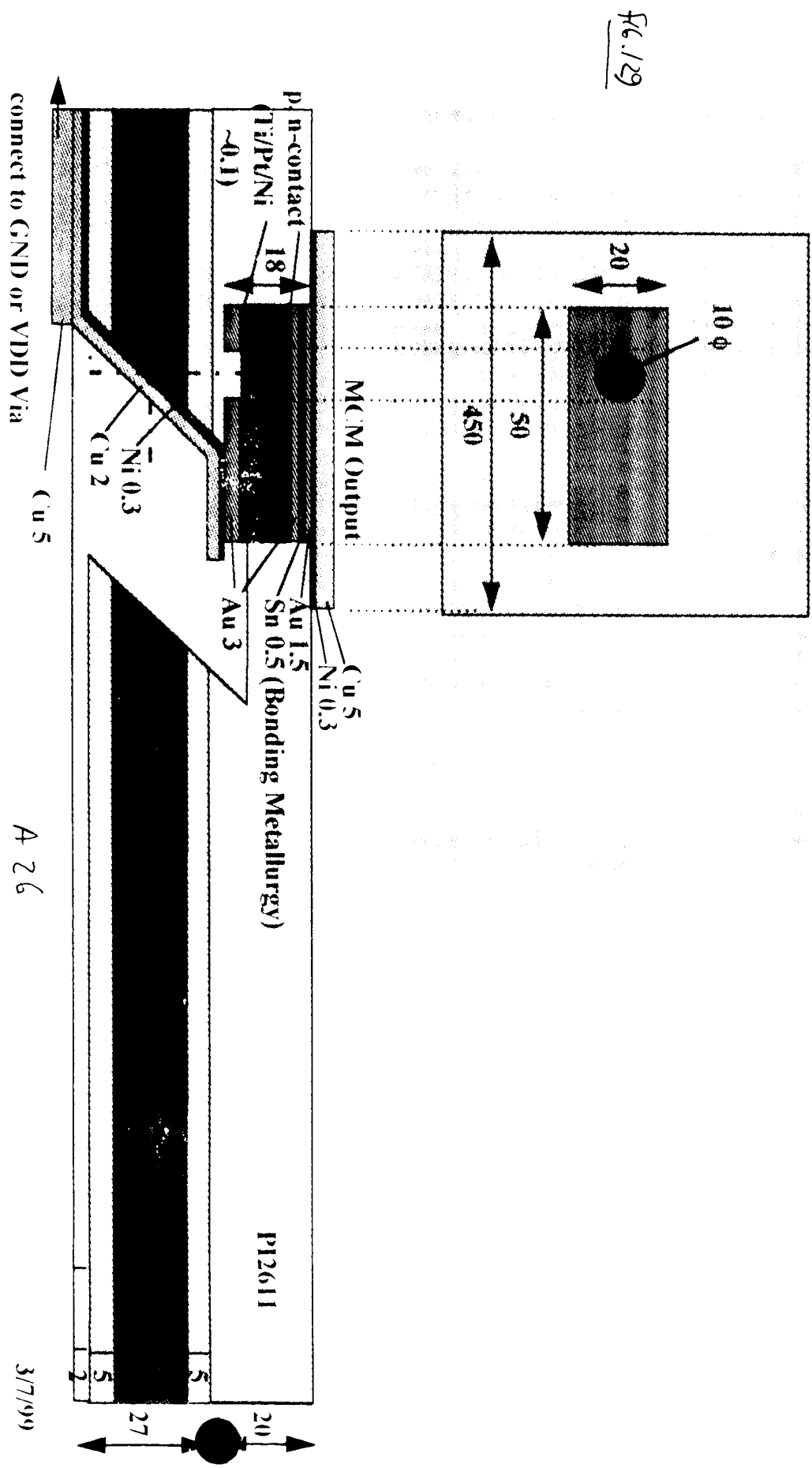
FOLM Structure Example (Overall)

Through put: 1.5 pbs x 196 ch Assume SSX MCM Size is ~5 cm x 5 cm

Unit: um



FOLM Structure Example (VCSEL part)



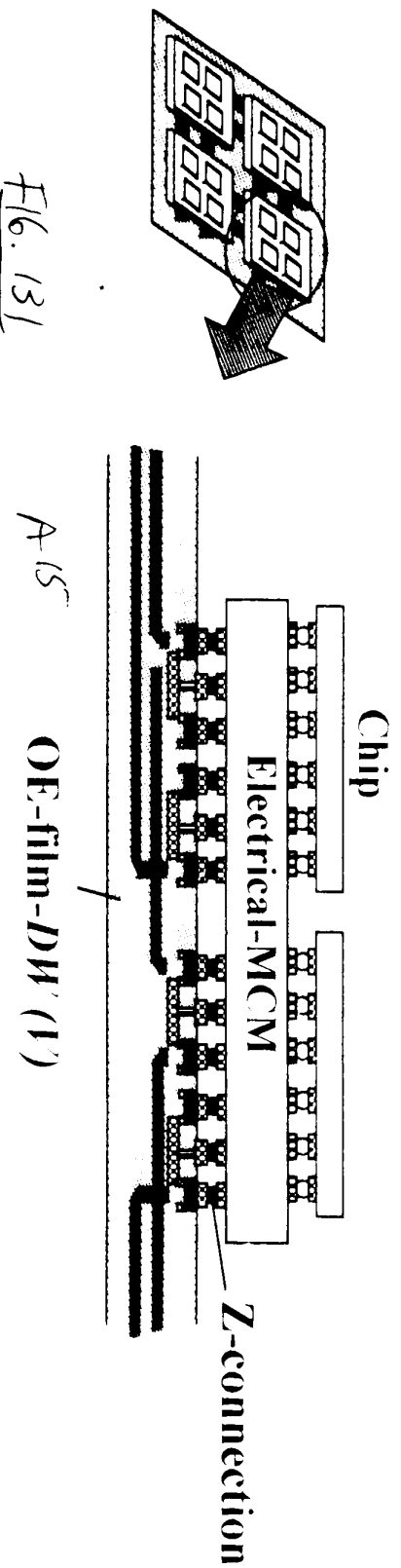
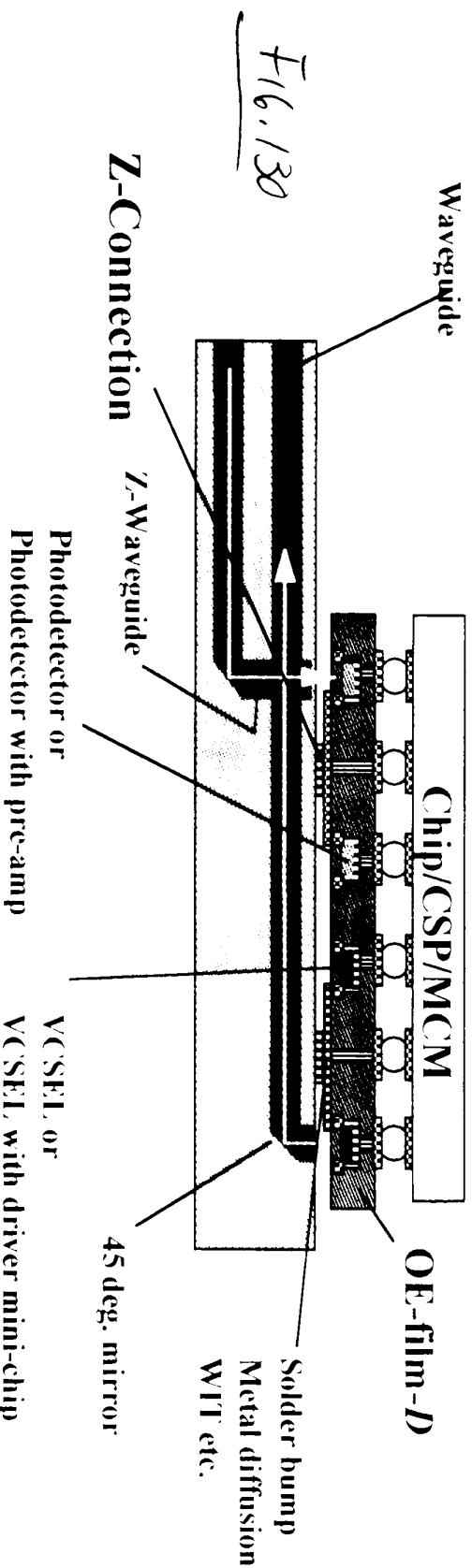
F6.128

Unit : μm

Figure 14

A26 3/7/99

OE-film: OE-IP, OE-Film-MCM

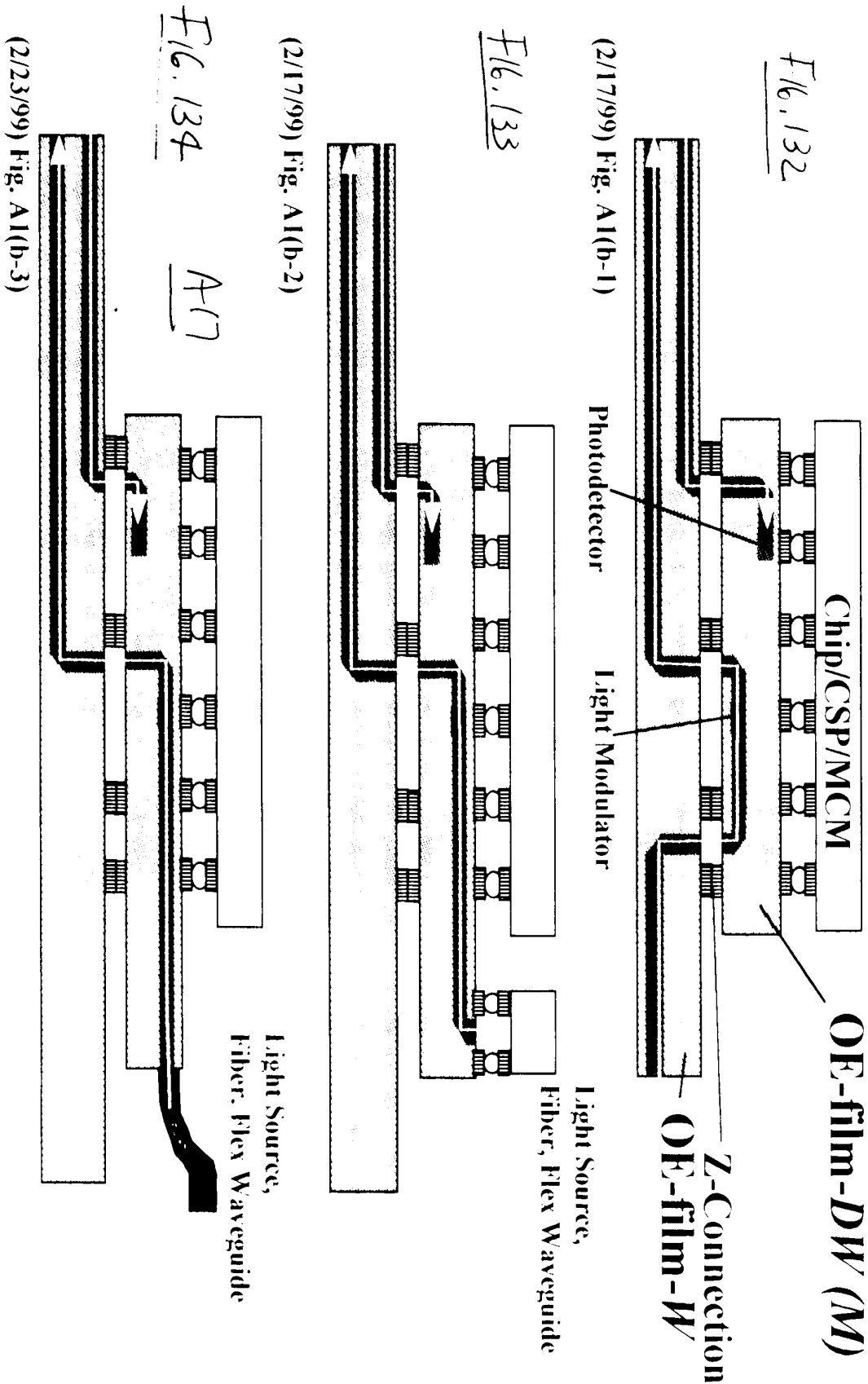


(2/23/99) Fig. New-A1-Modified

Figure 5

A15 3/7/99 *Fig. 131*

OE-film: Light Modulator Transmitters



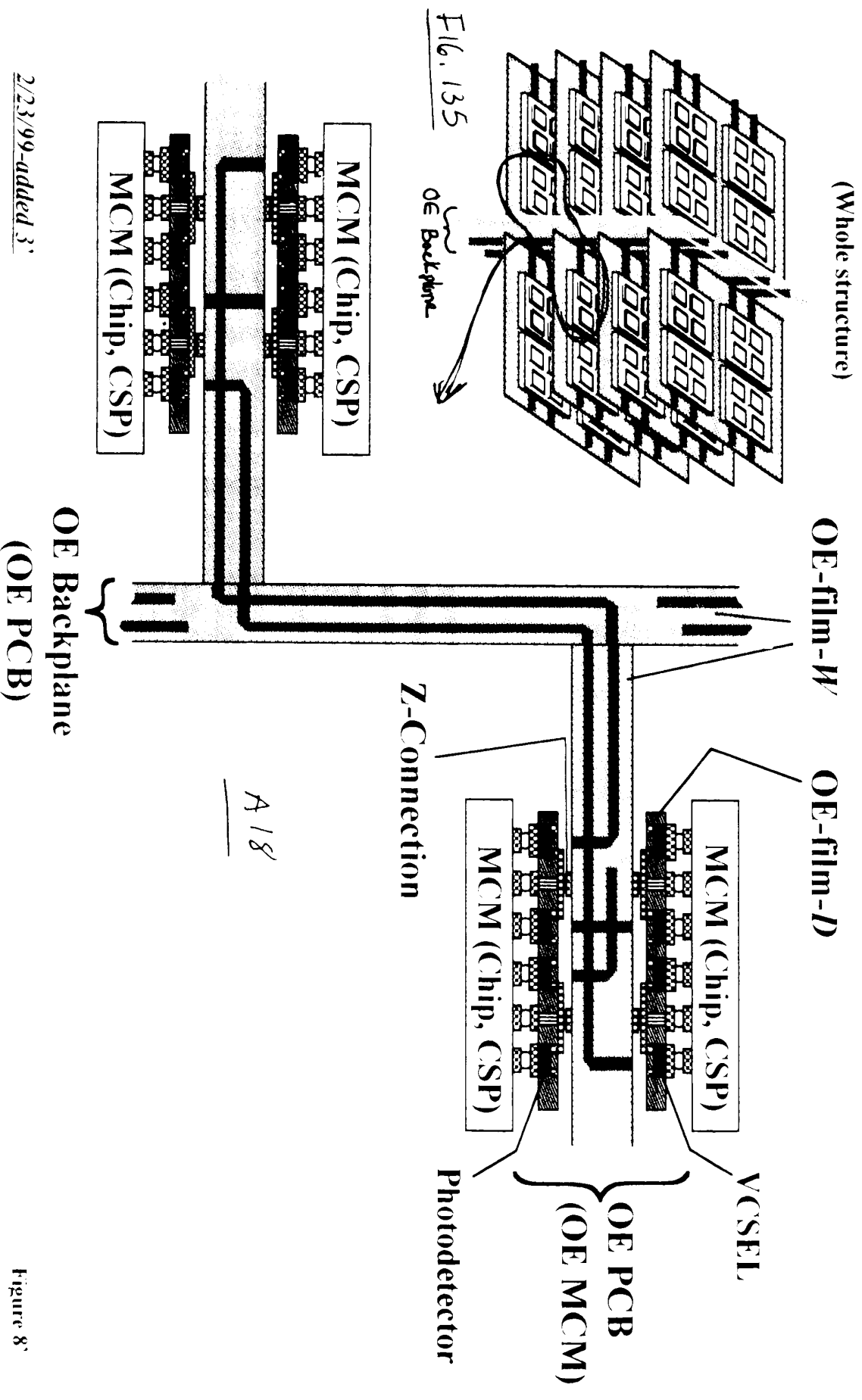
Examples of Light Modulators: Electro-Optic (EO) Modulator, Electro-Absorption (E-A) Modulator

Figure 7

A17 3/7/99

A1

OE-film: Both-Side Packaging

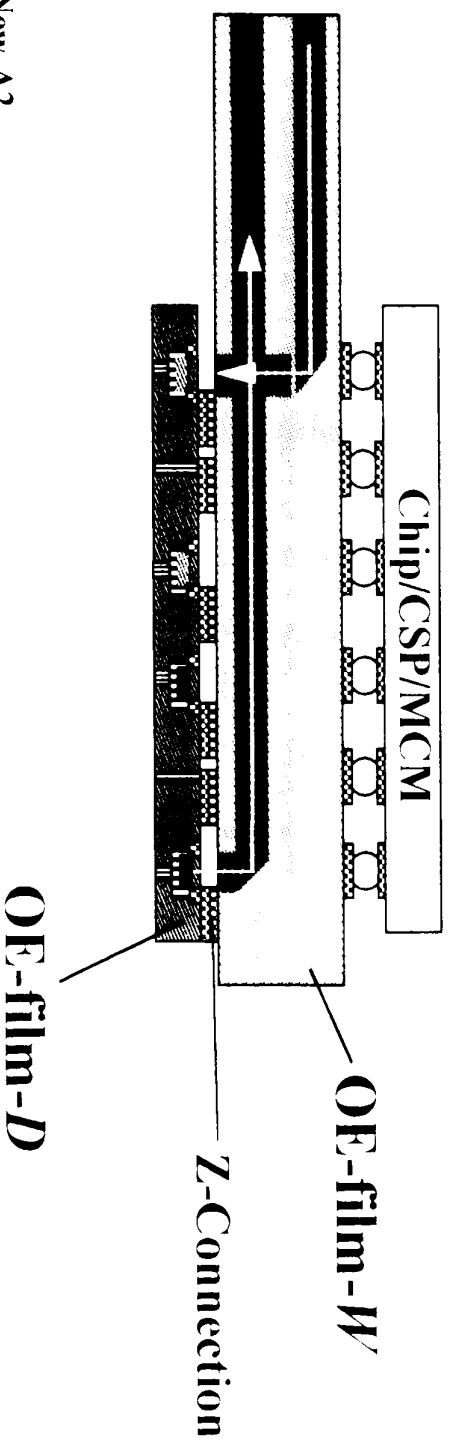


2/23/99-added 3'

A18 3/7/99

Figure 8'

OE IP is Placed on the Oposit Side



(2/23/99) Fig. New-A2

Fl6.138

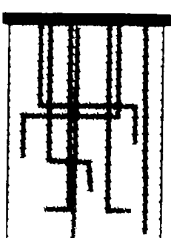
A20

Figure 10

A20 3/7/99

11231

Direct Jump from LSI



Can act as
Line length controller

Fiber Ribbon

Film Waveguide with Device Integration

Fig. 136

Connector

VCSEL

Photodiode

LSI

LSI

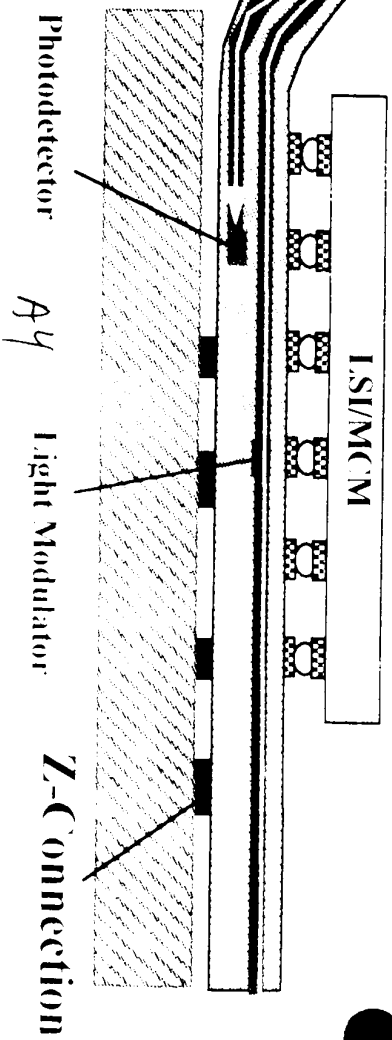
MCM

Electrical Board

Z-Connection

Fig. 137

Fig. New-A4-Modified



LSI/MCM

Photodetector

A4

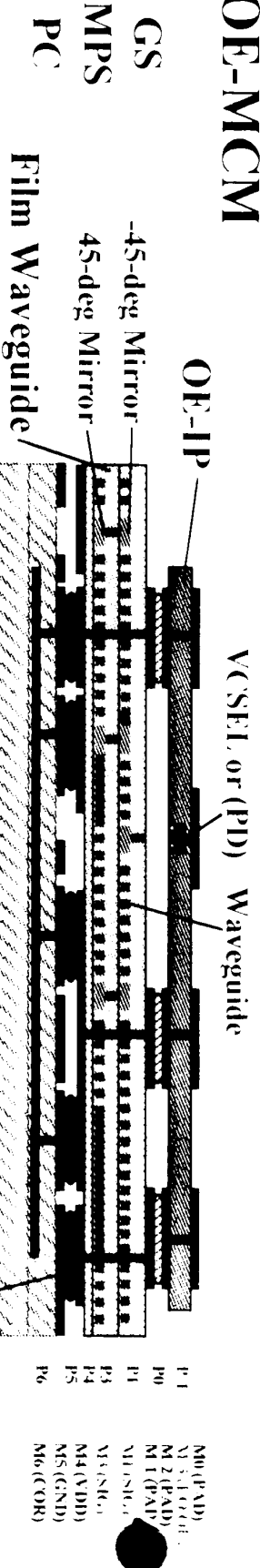
Light Modulator

Z-Connection

A4 1/18/99

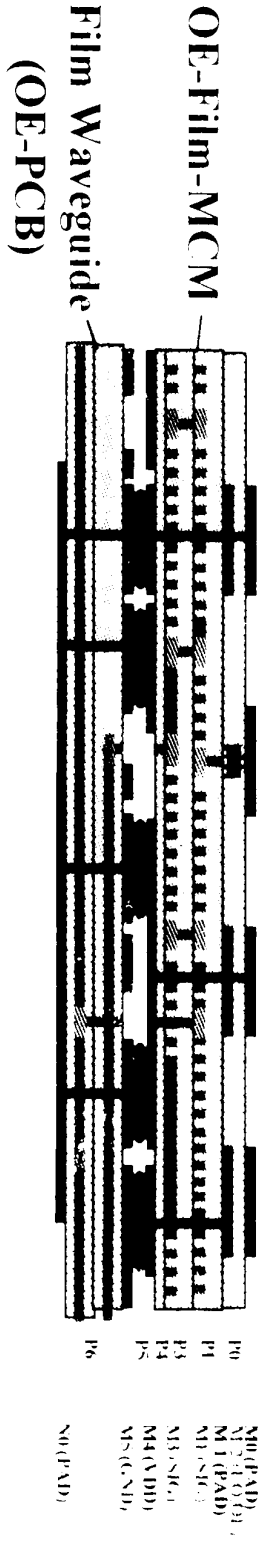
OE MCM

OE-MCM



F16.139

Z-Connection



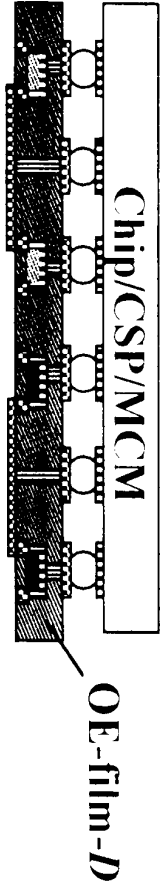
F16.140

AS

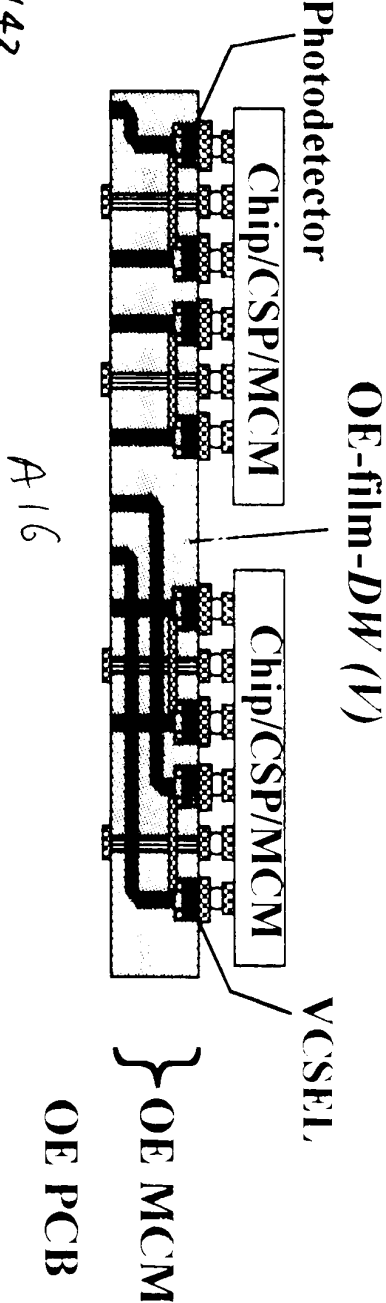
Fig. A5-Modfitec

AS 1/18/99

OE-film: Smart Pixel



Fl6.141



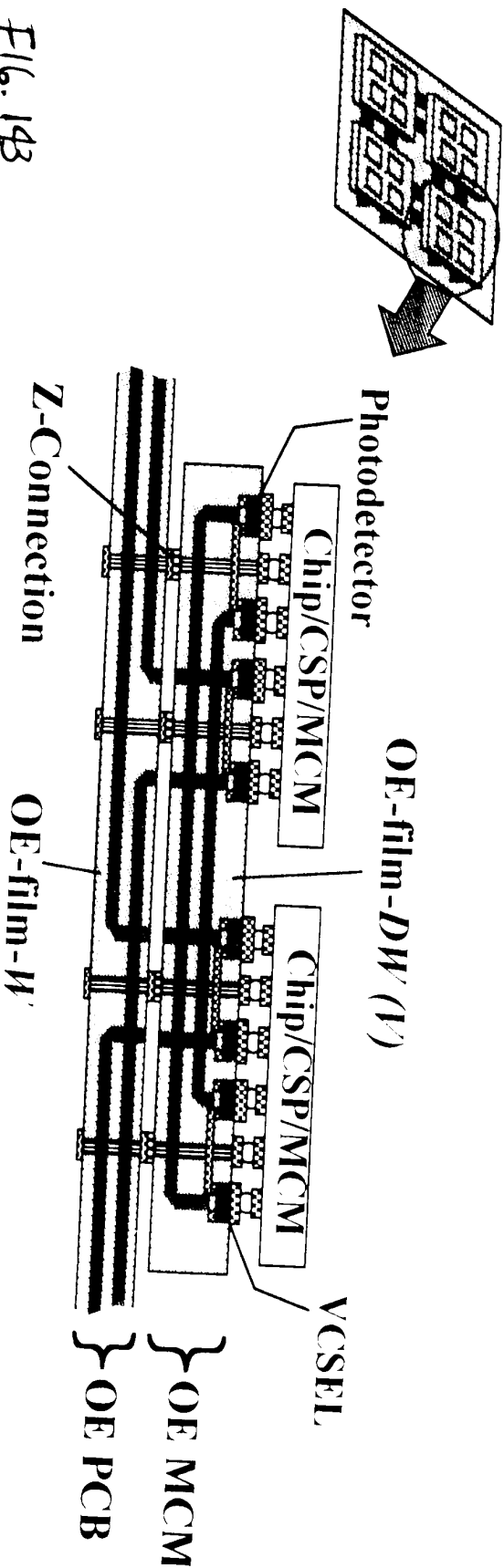
Fl6.142

2/23/99-added 6'

A16 3/7/99

Figure 6'

OE-Film/OE-Film Stack --- Back-Side Connection FCPt



Flc. 143

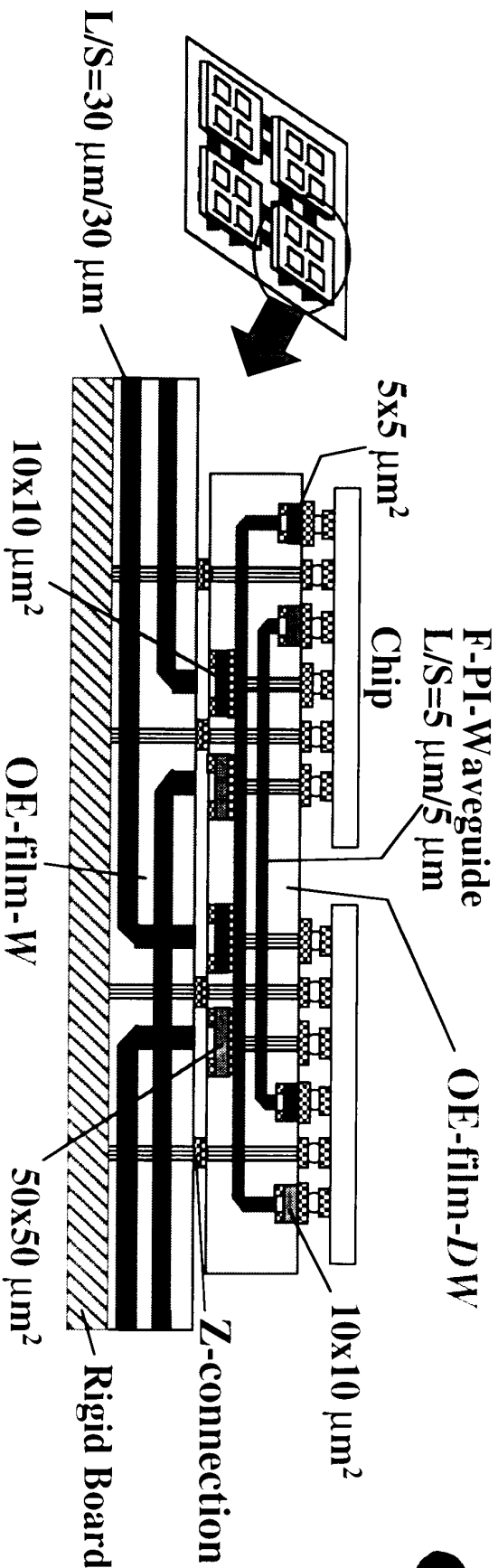
A19

2/23/99-added 4'

Figure 9'

A19 3/7/99

OE-Film/OE-Film Stack --- Back-Side Connection



01

File 144

3/7

Fig. 3/18/99-1

01 3/18/99

OE-MCM/OE-Bord Stack

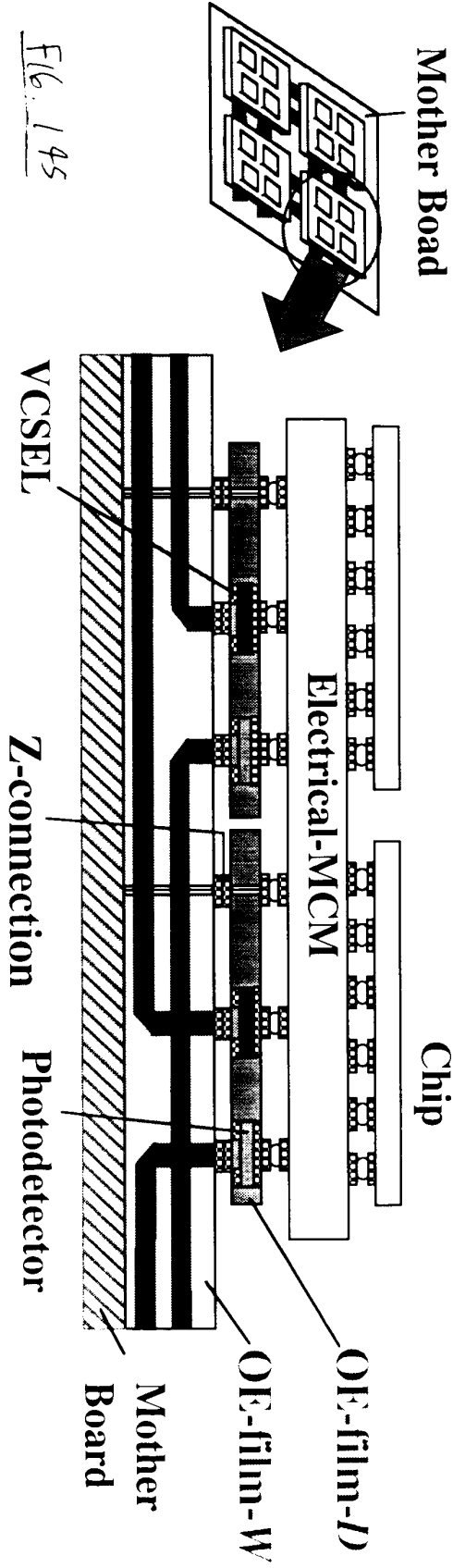


Fig. 145

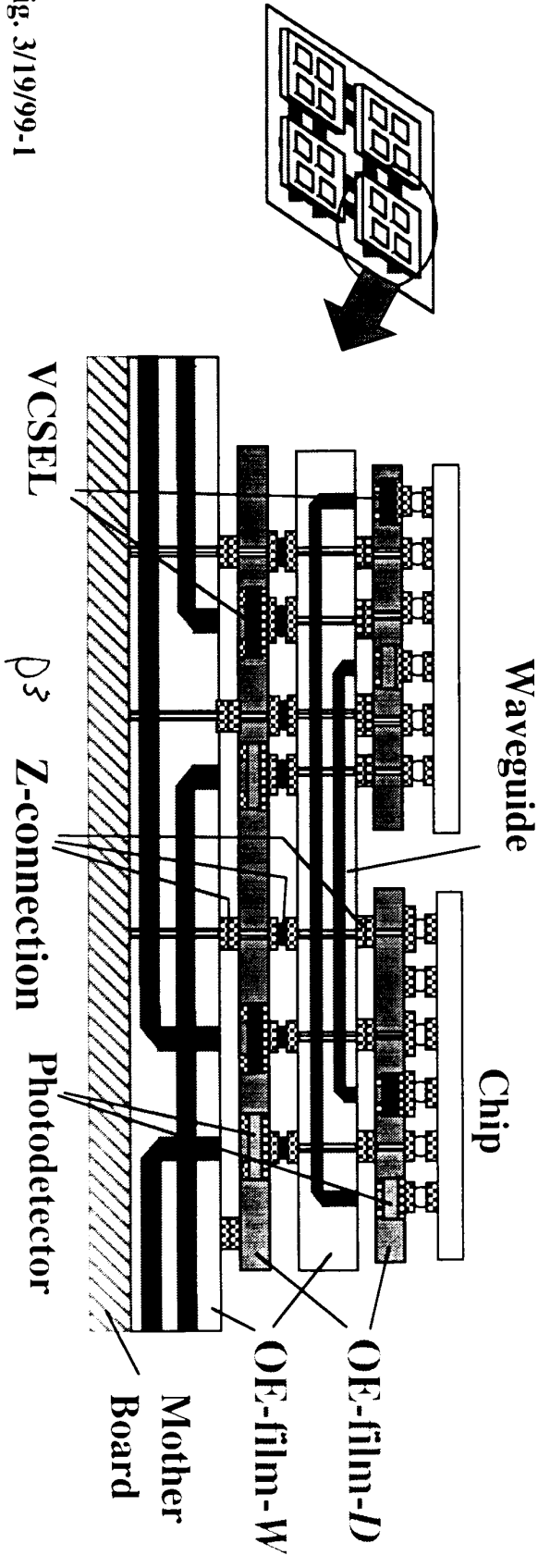
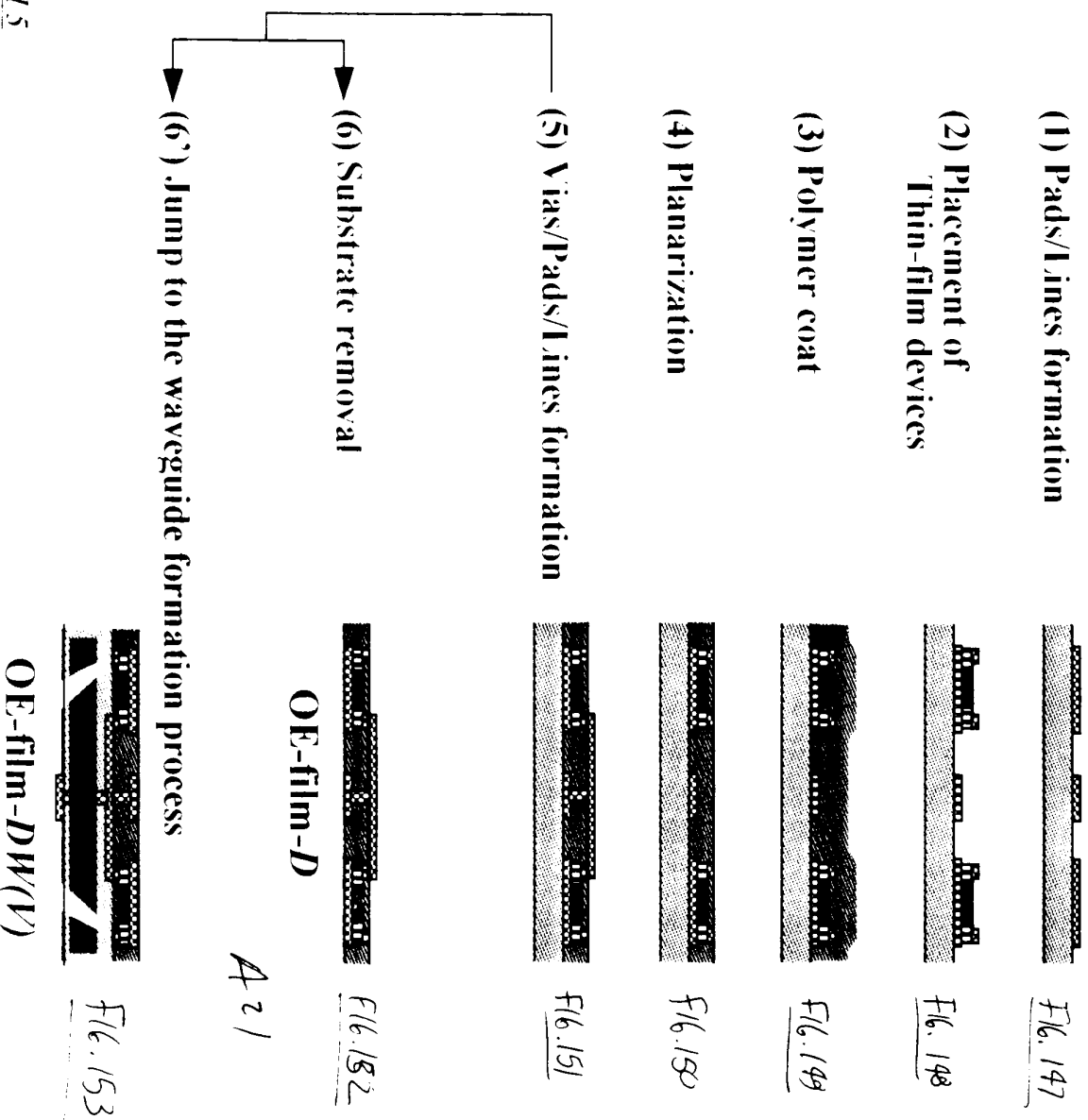


Fig. 3/19/99-1

Fig. 146

Device Integration Process



2/17/99-added 5